Safety in System: Protection for Man and Machine.

Innovations 2010/2011

SCHMERSAL

Safe solutions for your industry

Training at Schmersal's.
In the new tec.nicum at Wuppertal.

The international regulations regarding the safety of machinery and the corresponding safety switches become ever more complex. Especially the safety switches require additional explanations and instructions for use due to the integrated electronics that allow for an optimal adaptation to the specific application.
For mechanical engineers and machine users, the mission is quite "simple": if they want to comply with the requirements of the harmonised directives and standards and simultaneously achieve the summit of safety and productivity, they need good advice. And who is in a better position to give such advice than experts dealing with these issues every day?

That is why the Schmersal Group has set up "tec.nicum". This modern training centre, dealing exclusively with questions regarding the safety of machinery, is accommodated in an approximately 2,000 m² large facility, where the latest seminar techniques utilized in an inspiring atmosphere and where learning becomes fun.

The seminars and workshops, conducted by experienced employees, partners from the CE network and external consultants, address both the machinery manufacturers and machine users. The experiences from the Schmersal Group, gained from the participation to and collaboration with the EC standardisation bodies as well as the comprehensive practical know-how acquired from the daily contact with the customers of course are an excellent base to start from.

The brochure with the current seminar programme is available from Schmersal.

Content

Innovations 2010/2011
This brochure contains an overview of the innovations – new products, upgraded or enhanced products or modifications of existing products series – from the Schmersal Group, which will been released on the market in 2010/2011.
We want to offer you an overview of our innovations, whilst keeping the technical information as compact as possible. The detailed descriptions of the products can be found in the individual thematic brochures either in the main catalogues from Schmersal and Elan.
Our particularly comprehensive product range with detailed product information can also be consulted on the Internet at www.schmersal.com.

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Innovations

PROTECT-SELECT

To protect machinery and plants with different safety requirements, either a combination of safety-monitoring modules or a programmable safety controller was installed.

The Schmersal Group introduces PROTECT SELECT (or PROTECT SELECT WL with safe radio link), a component, which features the same level of performance as a safety controller and can be handled as smoothly as a safety-monitoring module.

For more information, see catalogue page 26

RSS 36

The RSS 36 electronic safety sensor with unique diagnosis meets the highest safety requirements, even when series-wired. Besides the well-known advantages of the CSS sensors, the RSS 36 also features new coding functions for the uniform allocation of the actuator to the sensor; this is realised through the integrated RFID technology. Three different coding variants enable an optimal conformation to the required protection against tampering.

The universal mounting features and the optional latching function provides for a smooth and rational integration in separating safety guards

For more information, see catalogue page 8

MZM 100 / MZM 120

A new version of the MZM 100 solenoid interlock is now available, in which the latching force of the safety guard can be adjusted to the individual circumstances by means of a target. The latching force of the optional permanent magnet maintains the closed condition of the safety guard, even in de-energised condition (approx. 30 N).

The MZM 120 is a safety sensor with guard locking function. Due to the special NEDOX® SF-2 coating, the sensor is also suitable for use in hygiene-critical applications.

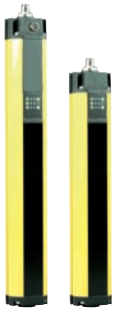
For more information, see catalogue page 18

BDF control panels

The Schmersal Group has developed a modular system of control panels, which can be configured in accordance with the needs of the operator. The slim and shock-resistant thermoplastic enclosure can be quickly fixed to customary aluminium profile systems. The multifunctional execution of the BDF 200 has room for four operating elements. The compact version of the BDF 100 can be equipped with one operating element.
The user can choose from a large range of illuminated pushbuttons, selector switches, LED indicator lights, key-operated switches and standard-compliant emergency stop command devices.

For more information, see catalogue page 36

SLC 421



The new SLC 421 safety light curtain series is characterised by a very user-friendly parameter setting feature. The (fixed/floating) blanking of beams can be realised in Teach-in mode by means of two external command devices.

For more information, see catalogue page 78

CSS 16

The application possibilities of the CSS technology are continuously extended.

One of the latest innovations is the electronic CSS 16 safety sensor, which has exactly the same dimensions as the AZ 16 electro-mechanical safety switch that is widely used in the entire industry.

The wear-free electronics of the CSS 16 also enables the realisation of series-wirings up to the highest safety level as well as a clearly visible diagnosis through the three-colour illuminated cable entry.

For more information, see catalogue page 10

Innovations

CSP 34

Another innovation is the CSP 34 electronic safety sensor with paired coding. These safety sensors cannot be tampered by means of external or substitute actuators.

Despite the high protection against tampering, the component offers a high flexibility, e.g. during the start-up procedure or in case of service.

This is possible, because the allocation of the actuator to the sensor is conducted by the user and since the actuator label is only covered in a tamper-proof manner after the definite assembly.

For more information, see catalogue page 14

Universal Gateway SD-I-U-…

For the collection, transmission and evaluation of the diagnostic-relevant signals of electronic safety sensors and solenoid interlock, a new generation of gateways with interfaces for different field bus systems is available. The available FIELD BUS interfaces are

PROFINET IO, EtherNet IP, Device-Net, CC-Link and CANopen.

For more information, see catalogue page 22

BNS 40S

The robust yet elegant new BNS 40S magnetic safety sensor with brushed stainless steel enclosure is particularly suitable for applications under rough ambient conditions.

Especially in applications in the food industry, the “Hygienic Design” BNS 40S is at its best. It offers a throughout clean and neat solution due to features such as the enclosure, which is completely encapsulated in stainless steel without dust pockets, laser inscription, IP69K protection class and the food-safe connecting cable.

For more information, see catalogue page 48

SRB 301MA

The safety-monitoring module product family has been extended for applications in the default range. Until now, the user has the choice between the comfortable SRB 301ST V.2 and the economical SRB 301MC, which however is only suitable for applications where the risk of accessing the hazardous zone from behind is excluded.

For applications where there is a risk of accessing the hazardous zone from behind, the SRB 301MA safety-monitoring module now is available as economical alternative with compatible terminals.

For more information, see catalogue page 30

AS-Interface

The Schmersal Group has once more extended its product range of safety switching appliances with integrated AS-i Safety at Work interface.

The modular control panel BDF 200 AS can be configured in accordance with the needs of the user; with this control panel, the operator can activate the necessary functions at the safety guard, e.g. emergency stop, start/stop and reset.

Furthermore, all position switches of the Z/T 235,236 and 256 series as well as the T 335 and 336 series are now available with AS-Interface.

For more information, see catalogue page 52

Explosive atmospheres

The range of switching appliances for explosive atmospheres of Zone 1 and 21 as well as Zone 22 has been completed by, amongst others, the EX-ZQ 900-3D pull-wire switch and the EX-T 335 position switch.

For more information, see catalogue page 74

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Online on the worldwide web

For detailed information, check out
www.schmersal.com

Electronic safety sensors and interlocks

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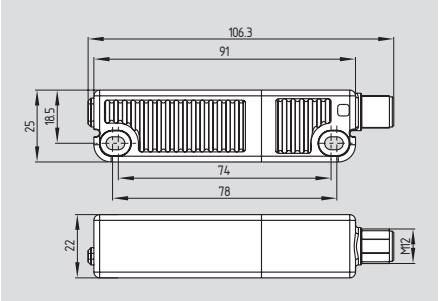
- Y-adapter _____ Page 23

The CSS technology is an electronic operating principle for the non-contact communication between the safety sensor and the actuator, developed and patented by the Schmersal Group.
This “Coded Safety Sensor” (CSS) principle guarantees, in addition to a high switching distance, also a high level of interference resistance as well as a high degree of protection against tampering. Misaligned actuation of the sensors is possible as well; when the sensor is operating near the hysteresis range, a premature warning is emitted in order to prematurely inform the user e.g. about a misaligned safety guard.
The RSS 36 is the next step in the continued development of the safety sensor technology.
As the RSS 36 is equipped with the RFID technology, different variants, each with different coding possibilities, can be produced. In this way, the adequate protection against tampering can be chosen for each application, depending on the needs. Just like the sensors with CSS technology, the new RSS 36 electronic safety sensor is suitable for series-wiring in safety circuits with the highest safety level and can be combined with all components of the CSS family.

In the new version of the MZM 100 solenoid interlock, a permanent magnet maintains the closed condition of the safety guard with a force of 30N in unlocked and/or de-energised condition. Optionally, the latching force of the safety guard can be adjusted to the local circumstances by means of a target. Another innovation is the MZM 120. This variant with special surface coating meets the requirements of hygiene-critical environments with rough ambient conditions. For the evaluation of the serial diagnostic signals, a new Gateway generation with interfaces for the most commonly used field bus systems is available.

Sensor RSS 36



- Thermoplastic enclosure
- 2 short-circuit proof, p-type safety outputs (24 VDC per 250 mA)
- Increased protection against tampering by optional individual coding of safety sensor and actuator
- Optional version with latching available
- Safety and diagnostic signals can be wired in series
- Integral cross-wire, wire breakage and external voltage monitoring of the safety cables up to the control cabinet
- LED status indication
- Sensor with connecting cable or with integrated connector
- Robust due to the used cleaning agent-resistant materials and protection class up to IP69K

Approvals

TÜV cULus all under preparation CE

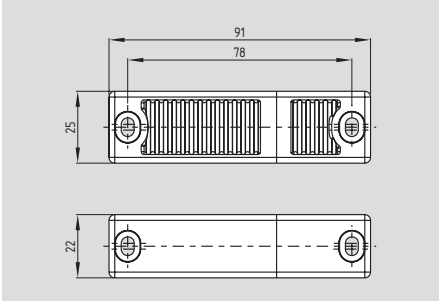
Ordering details

RSS 36 ①-②-③-④

No.	Option	Description
①		Standard coding
	I1	Individual coding
	I2	Individual coding, unlimited
②	D	With diagnostic output
	SD	With serial diagnostic
③		Without latching
	R	with latching, latching force approx. 25 N
④		With connecting cable 2 m
	ST	With integrated connector M12

Sensor and actuator must be ordered separately!

Actuator RST 36-1



- Thermoplastic enclosure
- Flexible fitting through universal mounting holes

Approvals

TÜV Certification in combination with safety sensor under preparation

Ordering details

Actuator	**RST 36-1**
Actuator, with latching magnet	**RST 36-1-R**

(The latching function is only active when RSS 36-…R is combined with RST 36-1-R.)

Technical data

Standards:	IEC 60947-5-3, EN ISO 13849-1, IEC 61508
Enclosure:	glass-fibre reinforced thermoplastic
Mode of operation:	RFID
Actuator:	RST 36-1, RST 36-1-R
Series-wiring:	unlimited number of components, however safety-dependent; max. 31 components for serial diagnosis
Connection:	Integrated connector M12 or connecting cable
- Integrated connector:	M12, 8-pole, A-coded
- Connecting cable:	Y-UL 2517 / 8 x AWG 22 / 8 x 0.35 mm², 2 m
Temperature resistance of the cable:	
- At rest:	−30 °C … +105 °C
- In movement:	−10 °C … +105 °C
Cable length:	max. 30 m
	(Cable length and cable section alter the voltage drop depending on the output current)
Switching distances to IEC 60947-5-3:	
Rates switching distance S_n:	12 mm
Assured switch-on point S_{ao}:	10 mm
Assured switch-off point S_{ar}:	16 mm
Hysteresis:	2.0 mm
Repeat accuracy:	< 0.5 mm
Ambient conditions:	
Ambient temperature Tu: max. output current	
≤ 0,1 A / output	−25 °C … +70 °C
≤ 0,25 A / output	−25 °C … +65 °C
Storage and transport temperature:	−25 °C … +85 °C
Protection class:	IP65 / IP67 to EN 60529;
- Connector:	IP69K to DIN 40050-9
Resistance to vibration:	10…55 Hz, amplitude 1 mm
Resistance to shock:	30 g / 11 ms
Switching frequency f:	1 Hz
Response time:	≤ 100 ms
Duration of risk:	≤ 200 ms
Standby delay:	≤ 5 s
Electrical data:	
Rated operating voltage U_e:	24 VDC -15% / +10% (PELV to IEC 60204-1)
Rated operating current I_e:	0,6 A
Lowest operating current I_m:	0,5 mA
Required rated short-circuit current:	100 A

Note

Requirements for the safety controller

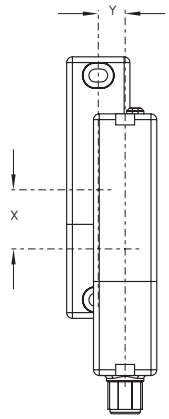
Dual-channel safety input, suitable for p-type sensors with normally-open (NO) function. The internal function tests of the sensors cause the outputs to cyclically switch off for max. 0.25 ms, this must be tolerated by the safety controller. The safety controller must not be equipped with cross-wire detection.

Technical data

Rated insulation voltage U_i:	32 V
Rated impulse withstand voltage U_{imp}:	800 V
No-load current I_0:	0,1 A
Protection class:	II
Overvoltage category:	III
Degree of pollution:	3
EMC interference immunity for the “functional safety”:	to IEC 61326-3-1
EMC interference immunity:	to IEC 60947-5-3
EMI:	to IEC 61000-6-4
Safety inputs X1/X2:	
Rated operating voltage U_{e1}:	24 VDC -15% / +10% (PELV to IEC 60204-1)
Safety outputs Y1/Y2:	p-type, short-circuit proof
Rated operating current I_{e1}:	max. 0,25 A
Utilisation category:	DC-12: U_e/I_e: 24 VDC/0,25 A DC-13: U_e/I_e: 24 VDC/0,25 A
Voltage drop:	U_e < 1 V
Diagnoseausgang:	p-type, short-circuit proof
Rated operating voltage U_{e2}:	U_e < 2 V
Rated operating current I_{e2}:	max. 0,05 A
Utilisation category:	DC-12: U_e/I_e: 24 VDC/0,05 A DC-13: U_e/I_e: 24 VDC/0,05 A
Serial diagnostic:	short-circuit proof
Operating current:	150 mA
Wiring capacitance for serial diagnostic:	max. 50 nF
External cable protection:	Fuse
- Integrated connector:	2,0 A
- Connecting cable:	4,0 A Please observe the cable section of the lead-on cable
LED functions:	
Green	Supply voltage on
Yellow	Operating status
Red	Error
Classification:	
Standards:	EN ISO 13849-1, IEC 61508, IEC 60947-5-3
PL:	up to e
Category:	up to 4
SIL:	suitable for SIL 3 applications
Mission time:	20 years
Classification:	PDF-M

Misalignment

Lateral actuation



Mounting tolerance or due to guard door sagging.
The axial misalignment (Y) is max. ± 8 mm.
The height misalignment (X) is max. ± 10 mm.

Coding procedure

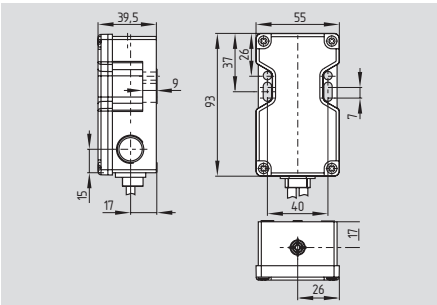
Ordering option -I1:
During the individual coding, a RST actuator is taught by a simple routine during the start-up procedure, so that every form of tampering by means of a replacement or substitute actuator is permanently excluded.

Ordering option -I2:
Teaching the individual coding of a RST actuator by a simple routine during the start-up procedure (as -I1). A protected coding process enables the teaching of a new actuator for service purposes.

Note

Detailed information regarding the use of serial diagnosis can be found in the mounting and wiring instructions of the SD Gateway and in the instructions for the integration of the SD-Gateway.

Sensor CSS 16



- Thermoplastic enclosure
- Electronic, non-contact, coded system
- Large switching distance
- Misaligned actuation possible
- High repeat accuracy of the switching points
- Self-monitored series-wiring of max. 16 sensors
- Max. length of the sensor chain 200 m
- Comfortable diagnose through sensor LED and diagnostic output
- Early warning when operating near the limit of the sensor's hysteresis range
- 2 short-circuit proof, p-type safety outputs (24 VDC per 500 mA)

Approvals

under preparation

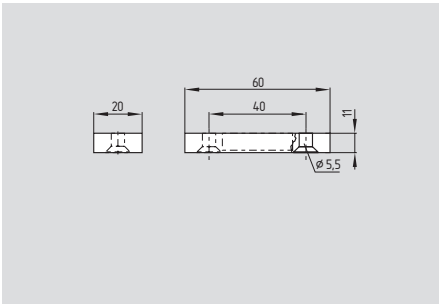
Ordering details

CSS 8-16-①-②-③

No.	Option	Description
①	2P	2 p-type safety outputs
	2P+D	2 p-type safety outputs and 1 p-type signal contact (diagnostic)
②	E	End or single device
	Y	Device for series-wiring
	M	Multifunction device
③	L	Connecting cable
	LST	Connecting cable and connector

Sensor and actuator must be ordered separately!

Actuator CST 16-1



- Thermoplastic enclosure

Approvals

Certification in combination with safety sensor under preparation

Ordering details

Actuator **CST 16-1**

Technical data

Standards: IEC 60947-5-3, EN ISO 13849-1, IEC 61508
Enclosure: glass-fibre reinforced thermoplastic
Mode of operation: inductive
Actuator: CST 16-1

Switching distances to IEC 60947-5-3:

Rates switching distance S_n: 8 mm
Assured switch-on distance S_{ao}: 7 mm
Assured switch-off distance S_{ar}: 11 mm
Hysteresis: max. 1.0 mm
Repeat accuracy R: < 0.5 mm
Switching frequency f: 3 Hz
Series-wiring: max. 16 components
Cable length: max. 200 m
(Cable length and cable section alter the voltage drop depending on the output current)
Cable: PVC / LIYY / 7 x 0.25 mm² / UL-Style Y-UL 2464 / 2 m
Cable section: according to execution:
4 x 0.5 mm², 5 x 0.34 mm², 7 x 0.25 mm²

Ambient conditions:

Ambient temperature T_u: −25 °C … +55 °C
for max. output current ≤ 500 mA /output
−25 °C … +65 °C
for output current ≤ 200 mA /output
Storage and transport temperature: −25 °C … +85 °C
Resistance to vibration: 10…55 Hz, amplitude 1 mm
Resistance to shock: 30 g / 11 ms
Protection class: IP65 / IP67

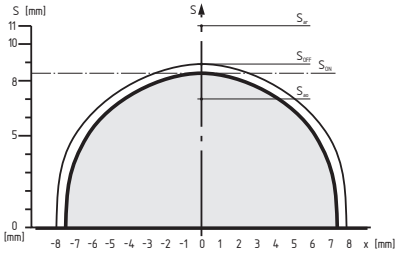
Electrical data:

Rated operating voltage U_e: 24 VDC −15% / +10% (stabilised PELV)
Rated operating current I_e: 1.1 A
Required ratedshort-circuit current: 100 A

Short-circuit protection:

External fuse:
1.0 A for output current ≤ 200 mA
1.6 A for output current > 200 mA
Rated insulation voltage U_i: 32 V
Rated impulse withstand voltage U_{imp}: 800 V
No-load current I_0: 0.05 A

Note



Legend

S Switching distance
V Misalignment
S_{on} Switch-on distance
S_{off} Switch-off distance **($S_{on} < S_h < S_{off}$)**
S_h Hysteresis area
S_{ao} Assured switch-on distance
S_{ar} Assured switch-off distance

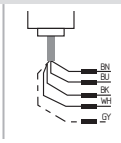
Technical data

Response time:	≤ 30 ms
Duration of risk:	≤ 30 ms
Protection class:	II
Overvoltage category:	III
Degree of pollution:	3
EMC rating:	to EN 61000-6-2
EMC interfering radiation:	to EN 61000-6-4
Safety inputs X1/X2:	
Rated operating voltage U_e:	24 VDC
	−15% / +10%
	PELV (to IEC 60204-1)
Rated operating current I_e:	1 A
Safety outputs Y1/Y2:	
	NO function, 2-channel, p-type, short-circuit proof
Voltage drop:	0.5 V
Rated operating voltage U_{e1}:	min. Ue - 0.5 V
Leakage current I_r:	≤ 0.5 mA
Rated operating current I_{e1}:	max. 0.5 A ambient temperature-dependent
Minimum operating current I_m:	0.5 mA
Utilisation category:	DC-12 Ue/Ie 24 VDC/0.5 A
	DC-13 Ue/Ie 24 VDC/0.5 A
Diagnostic output:	p-type, short-circuit proof
Voltage drop:	< 4 V
Rated operating voltage U_{e2}:	min. Ue - 4 V
Rated operating current I_{e2}:	max. 0.05 A
Utilisation category:	DC-12 Ue/Ie 24 VDC/0.05 A
	DC-13 Ue/Ie 24 VDC/0.05 A
Classification:	
Standards:	EN ISO 13849-1; IEC 61508; IEC 60947-5-3
PL:	up to e
Category:	up to 4
PFH value:	2.5 x 10^{-9} /h
SIL:	up to 3
Mission time:	20 years
Classification:	PDF-M

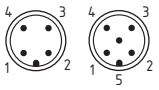
Connection

End or single device: CSS- 8-16-2P+…-**E**-L…

Connecting cable (2 m)
Cable section
4-pole: 4 x 0.5 mm²
5-pole: 5 x 0.35 mm²



Connecting cable (2 m)
with connector:
Connector male M12, 4-pole
Connector male M12, 5-pole



Colour of the connecting cable	Wiring	Pin configuration
BN (brown)	A1 U_e	Pin 1
BU (blue)	A2 GND	Pin 3
BK (black)	Y1 Safety output 1	Pin 4
WH (white)	Y2 Safety output 2	Pin 2
GY (grey)	Only 5-pole version: Diagnostic output (option)	Pin 5

Series-wiring device: CSS-8-16-2P-**Y**-LST

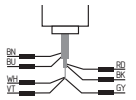
Inputs (IN):
Connecting cable (0.25 m)
with connector:
Connector female M12, 4-pole

Outputs (OUT):
Connecting cable (2 m)
with connector:
Connector male M12, 4-pole,

Wiring grey cable (IN)	black cable (OUT)	Pin configuration
A1 U_e	A1 U_e	Pin 1
A2 GND	A2 GND	Pin 3
X1 Safety input 1	Y1 Safety output 1	Pin 4
X2 Safety input 2	Y2 Safety output 2	Pin 2

Multifunction device: CSS-8-16-2P+D-**M**-L…

Connecting cable (2 m)
Cable section
7-pole: 7 x 0.25 mm²



Connecting cable (2 m)
with connector:
Connector male M12, 8-pole

Colour of the connecting cable	Wiring	Pin configuration
BN (brown)	A1 U_e	Pin 1
BU (blue)	A2 GND	Pin 3
VT (violet)	X1 Safety input 1	Pin 6
WH (white)	X2 Safety input 2	Pin 2
BK (black)	Y1 Safety output 1	Pin 4
RD (red)	Y2 Safety output 2	Pin 7
GY (grey)	Diagnostic output	Pin 5
–	Spare	Pin 8

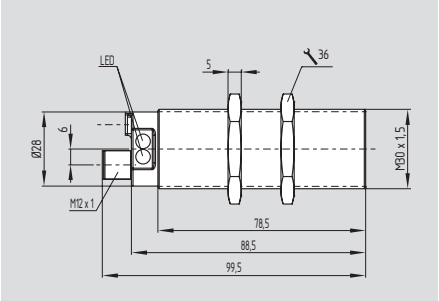
Note

Requirements for the safety controller
Dual-channel p-type safety input. The internal function tests of the sensors cause the outputs to cyclically switch off for max. 2 ms, this must be tolerated by the safety controller.

Note

- Series-wiring of sensors:
  A chain of 16 self-monitored CSS 16 safety sensors can be wired in series without loss of PL e or category 4 to EN ISO 13849-1. In this configuration, the redundant output of the first sensor is wired to the input of the next sensor.
- The voltage drop over a long sensor chain should be taken into account when planning cable routing. It depends on several factors, which are operating voltage, cable length and section, ambient temperature, number of series-wired sensors and the input load of the safety controller.

Sensor CSS 300



- Thermoplastic enclosure
- Ø M30
- suitable for concealed mounting behind stainless steel
- 2 short-circuit proof, p-type safety outputs (24 VDC per 250 mA)
- Self-monitored series-wiring of max. 31 sensors
- Comfortable diagnose through sensor LED and diagnostic output
- Max. length of the sensor chain 200 m
- Integral cross-wire, wire breakage and external voltage monitoring of the safety outputs
- With integrated connector

Approvals

TÜV* cULus * under preparation CE

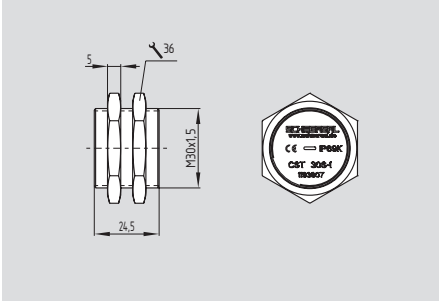
Ordering details

CSS 11-300-①-M-ST

No.	Option	Description
①	D	with diagnostic output
	SD	with serial diagnostic function

Sensor and actuator must be ordered separately!

Betätiger CST 30S-1



- Stainless steel enclosure
- Ø M30

Approvals

TÜV* * Certification in combination with safety sensor under preparation

Ordering details

Actuator	**CST 30S-1**

Technical data

Standards:	IEC 60947-5-3, EN ISO 13849-1, IEC 61508
Enclosure:	thermoplastic
Mode of operation:	inductive
Actuator:	coded CST 30S-1
Series-wiring:	max. 31 components
Fuse:	external, 2 A
Cable length:	max. 200 m
Switching distances to IEC 60947-5-3:	
Rates switching distance S_n:	11 mm
Assured switch-on point S_{ao}:	8 mm
Assured switch-off point S_{ar}:	15 mm
Hysteresis:	< 2 mm
Repeat accuracy:	< 1 mm
Switching frequency f:	3 Hz
Integrated connector:	M12, 8-pole
Ambient conditions:	
Ambient temperature T_u:	−25 °C … +60 °C
Storage and transport temperature:	−25 °C … +85 °C
Resistance to vibration:	10…55 Hz, amplitude 1 mm
Resistance to shock:	30 g / 11 ms
Protection class:	IP 65, IP 67 to EN 60529
EMC rating:	to EN 61000-6-2
EMC interfering radiation:	to EN 61000-6-4
Electrical data:	
Rated operating voltage U_e:	24 VDC −15% / +10% (stabilised PELV)
Rated operating current I_e:	0.6 A
No-load current I_0:	max. 0.1 A; average 50 mA
Rated insulation voltage U_i:	32 V
Rated impulse withstand voltage U_{imp}:	0.8 kV
Response time:	< 60 ms
Duration of risk:	< 60 ms
Protection class:	II
Overvoltage category:	III
Degree of pollution:	3

Note

A detailed product description can be found in the „Electronic Safety Sensors and Solenoid Interlocks“ brochure.

Technical data

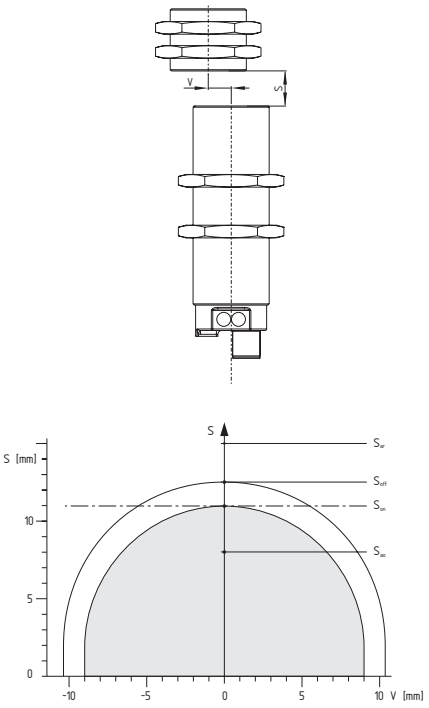
Safety outputs Y1/Y2:

	NO function, 2-channel, p-type, short-circuit proof
U_{e1}:	24 VDC −15% / +10%
Voltage drop:	< 1 V
Leakage current I_r:	< 0.5 mA
I_{e1}:	max. 0.25 A
Minimum operating current I_m:	0.5 mA
Utilisation category:	DC-12, DC-13
U_{e1}/I_{e1}:	24 VDC / 0.25 A
Required rated short-circuit current:	100 A
Diagnostic output:	p-type, short-circuit proof
U_{e2}:	24 VDC −15% / +10%
Voltage drop:	< 5 V
I_{e2}:	max. 0.05 A
Utilisation category:	DC-12, DC-13
U_{e2}/I_{e2}:	24 VDC / 0.05 A
Serial diagnostic:	
Operating current:	150 mA short-circuit proof
Wiring capacitance for serial diagnostic:	max. 50 nF
Classification:	
Standards:	EN ISO 13849-1; IEC 61508; IEC 60947-5-3
PL:	e
Category:	4
PFH value:	3.6 x 10^{-9} /h
SIL:	suitable for SIL 3 applications
Mission time:	20 years
Classification:	PDF-M

Misalignment

The actuating curves represent the switch-on and switch-off distances of the CSS 300 safety sensor by the approach of the CST 30S-1 actuator.

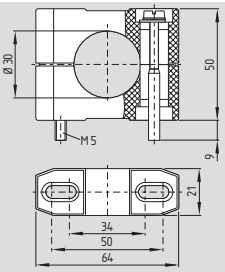
If the safety sensor is mounted behind non-ferromagnetic stainless steel (V4A) either flush-mounted, the switching distance is reduced.



Legend

S	Switching distance
V	Misalignment
S_{on}	Switch-on distance
S_{off}	Switch-off distance
S_h	Hysteresis area $s_h = s_{on} - s_{off}$
S_{ao}	Assured switch-on distance
S_{ar}	Assured switch-off distance

System components



Terminal mounting H 30

Note

Detailed information about the use of serial diagnosis can be found in the mounting and wiring instructions of the SD Gateway and in the instructions for the integration of the SD Gateway.

Note

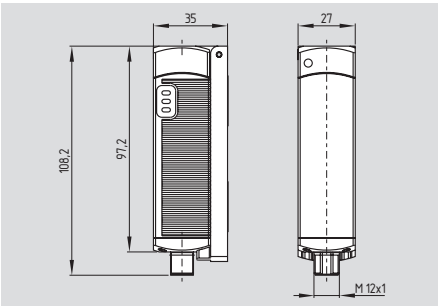
Requirements for the safety controller
The safety monitoring module must tolerate internal functional tests of the safety outputs for 250 µs –1500 µs.

The 250 µs switch-off time of the safety sensor additionally will be extended depending on the cable length and the capacity of the cable used. Typically, a switch-off time of 500 µs is reached with a 100 m connecting cable. The safety monitoring module does not need to have a cross-wire short monitoring function

Ordering details

Terminal mounting	**H 30**

Sensor CSP 34



- Tampering protection by paired coding of safety sensor and actuator
- On-site acknowledgment (ordering suffix F2)
- 2 short-circuit proof, p-type safety outputs (24 VDC per 250 mA)
- Self-monitored series-wiring of up to 31 sensors
- Max. length of the sensor chain 200 m
- Integral cross-wire, wire breakage and external voltage monitoring of the safety cables up to the control cabinet
- With integrated connector:
- Thermoplastic enclosure

Approvals

under preparation

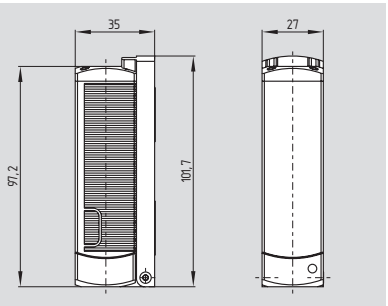
Ordering details

CSP 11-34①-D-M-ST

No.	Option	Description
①		without on-site acknowledgment
	F2	with on-site acknowledgment

Sensor and actuator must be ordered separately!

Actuator CSP 34-S-1



- CSP 34 safety sensor and CSP 34-S-1 actuator are isometric
- Sensor and actuator must be ordered separately
- 20 different actuator codes available

Approvals

Certification in combination with safety sensor under preparation

Ordering details

CSP 34-S-1-①

No.	Option	Description
①	1 … 20	Coding 1-20

Technical data

Standards:	IEC 60947-5-3, EN ISO 13849-1, IEC 61508
Enclosure:	glass-fibre reinforced thermoplastic
Mode of operation:	inductive
Actuator:	coded CSP 34-S-1
Series-wiring:	max. 31 components
Cable length:	max. 200 m
Switching distances to IEC 60947-5-3:	
Rates switching distance S_n:	11 mm
Assured switch-on distance S_{ao}:	8 mm
Assured switch-off distance S_{ar}:	15 mm
Hysteresis:	max. 1.5 mm
Repeat accuracy:	< 0.5 mm
Switching frequency f:	3 Hz
Integrated connector:	M12, 8-pole in the enclosure
Ambient conditions:	
Ambient temperature T_u:	
For output current	
≤ 0.1 A/output	−25 °C … +70 °C
≤ 0.25 A/output	−25 °C … +65 °C
Storage and transport temperature:	−25 °C … +85 °C
Resistance to vibration:	10…55 Hz, amplitude 1 mm
Resistance to shock:	30 g / 11 ms
Protection class:	IP65, IP67 to EN 60529
Electrical data:	
Rated operating voltage U_e:	24 VDC −15% / +10% (stabilised PELV)
Rated operating current I_e:	0.6 A
Required rated short-circuit current:	100 A
Fuse:	2.0 A
Rated insulation voltage U_i:	32 V
Rated impulse withstand voltage U_{imp}:	800 V
No-load current I_0:	0.1 A
Response time:	< 30 ms
Duration of risk:	< 60 ms
Protection class:	II
Overvoltage category:	III
Degree of pollution:	3
EMC rating:	to EN 61000-6-2
EMC interfering radiation:	environment A

Note

Technical data

Safety outputs Y1/Y2: NO function, 2-channel, p-type, short-circuit proof

Utilisation category:	DC-12, DC-13
U_{e1}:	min. (Ue – 1 V)
Voltage drop:	< 1 V
I_{e1}:	max. 0.25 A, ambient temperature-dependent
Leakage current I_r:	< 0.5 mA
Minimum operating current I_m:	0.5 mA
Diagnostic output:	p-type, short-circuit proof
Utilisation category:	DC-12, DC-13
U_{e2}:	min. (Ue –5 V)
Voltage drop:	< 5 V
I_{e2}:	max. 0.05 A
Classification:	
Standards:	EN ISO 13849-1; IEC 61508; IEC 60947-5-3
PL:	up to e
Category:	up to 4
PFH value:	3.6 x 10^{-9} /h
SIL:	suitable for SIL 3 applications
Mission time:	20 years
Classification:	PDF-M

Note

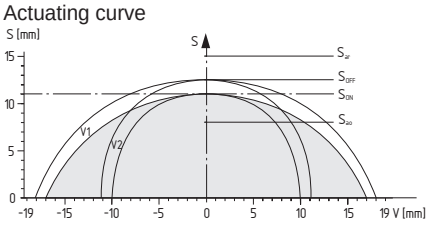
Coding of safety sensor and actuator
In order to activate the safety function (coding) of the CSP 34 for the first time, the actuator to be assigned first must be brought into the detection area of the activated safety sensor. The automatic teaching cycle of the actuator code will be signalled by the red LED on the safety sensor being activated and the yellow LED simultaneously flashing. After 10 seconds, brief cyclic flashing signals signal that the operating voltage of the safety sensor must be shut off for a few seconds, in order to save the code.
When the operating voltage is switched back on, the actuator must be redetected in order to definitively assign safety sensor and actuator. Now, the safety sensor no longer can be activated by another coding.
In order to protect the coding, the ordering details of the actuator are hidden by the mounting bracket.

On-site acknowledgment (ordering suffix F2)
For the guard door monitoring using a CSP 34F2 safety sensor, a reset/acknowledgment button for instance must be positioned at the safety guard in such manner that the operator has an overview of the hazardous area. When the button is pushed, a 24 VDC signal is generated at the reset input of the CSP 34F2. When the safety guard is closed, the safety outputs are enabled with the trailing edge of the reset signal. After opening of the safety guard, a new acknowledgment is required prior to the next enabling.

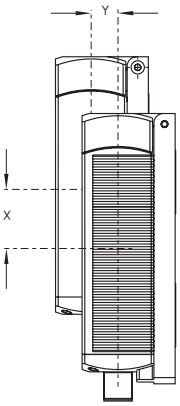
Misalignment

Actuation through the revolving side of sensor and actuator

Actuating curve



Possible misalignment



The actuating curves show the switch-on and switch-off distances of the CSP 34 sensor by the approach of the actuator.

Legend

S	Switching distance
	Possible misalignment through
X	the long side with identification plate
Y	the small side with identification plate
S_{on}	Switch-on distance
S_{off}	Switch-off distance
S_h	Hysteresis area $s_h = s_{on} - s_{off}$
S_{ao}	Assured switch-on distance
S_{ar}	Assured switch-off distance to IEC 60947-5-3

Note

Requirements for the safety controller
Dual-channel safety input, suitable for p-type sensors with normally-open (NO) function. The internal function tests of the sensors cause the outputs to cyclically switch off for max. 0.5 ms, this must be tolerated by the safety controller. The safety controller must not be equipped with cross-wire detection.

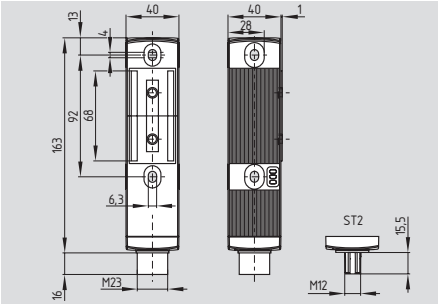
Note

A detailed product description can be found in the „Electronic Safety Sensors and Solenoid Interlocks“ brochure.

Misalignment

The long side allows for a max. displacement of sensor and actuator of 30 mm (e.g. mounting tolerance or due to guard door sagging).
The long side allows for a maximum transverse misalignment of approx. 8 mm.

MZM 120



Safety sensor with interlocking function
MZM 120 B:
enabling signal, when safety guard closed
MZM 120 BM:
enabling signal, when safety guard closed and locked (without force monitoring)

- Metal components with hygiene-compliant NEDOX® SF-2 coating
  - Suitable for contact with foodstuffs
  - Hard surface
  - Excellent resistance to abrasion
  - Excellent resistance to corrosion
  - Excellent anti-adhesive features
- Protection class IP69K
- Power to lock principle
- Safety sensor must be used as end stop.
- Holding force max. 500 N
- Variably adjustable latching
- Sensor technology permits an offset between actuator and sensor of ± 5 mm vertically and ± 3 mm horizontally
- Intelligent diagnostic signalling of failures
- Series-wiring of max. 31 components

Approvals

* * under preparation

Technical data

Standards:	EN 60947-5-1, IEC 60947-5-3, EN ISO 13849-1, IEC 61508
Material of the enclosure:	glass-fibre reinforced thermoplastic, self-extinguishing
Material of the actuating surface:	NEDOX® SF-2 coated
Mechanical life:	≥ 1 million operations (for guards ≤ 5 kg; actuating speed ≤ 0.5 m/s)
$F_{max.}$:	500 N
Protection class:	IP67, IP69K
Protection class:	II, ⧈
Overvoltage category:	III
Degree of pollution:	3
Connection:	connector M12
Series-wiring:	**max. 31 components**
Cable length:	max. 200 m (Cable length and cable section alter the voltage drop depending on the output current)
Ambient conditions:	
Ambient temperature:	−25 °C … +55 °C
Storage and transport temperature:	−25 °C … +85 °C
Relative humidity:	30% … 95%, non-condensing, no icing
Resistance to vibration:	10…150 Hz (0.35 mm/5 g)
Resistance to shock:	30 g / 11 ms
Switching frequency f:	1 Hz
Response time:	< 100 ms
Duration of risk:	< 100 ms
Time to readiness:	< 4 s
Electrical data:	
U_e:	24 VDC −15% / +10% (stabilised PELV)
Operating current:	max. 0.6 A plus current through the safety outputs
I_e:	1 A
I_0:	max. 0.6 A
U_{imp}:	800 V
U_i:	32 VDC
Fuse rating:	internally short-circuit proof
Device insulation:	≤ 2 A to UL 508; depending on the number of components and loads (Y1, Y2 and OUT)

Technical data

Safety inputs X1 and X2:	
Voltage range – 3V … 5V:	Low
Voltage range 15V … 30V:	High, typically 4 mA at 24 V
Safety outputs Y1 and Y2:	p-type, short-circuit proof
U_{e1}:	0 V up to 4 V under U_e
I_{e1}:	max. 0.25 A
Utilisation category:	DC-13
Leakage current I_r:	≤ 0.5 mA
Diagnostic output OUT:	p-type, short-circuit proof
U_{e2}:	0 V up to 4 V under U_e
I_{e2}:	max. 0.05A
Utilisation category:	DC-13
Wiring capacitance for serial diagnostic:	max. 50 nF
Solenoid control IN:	
Voltage range – 3V … 5V:	Low
Voltage range 15V … 30V:	High, typically 10 mA at 24 V, dynamically 20 mA
Solenoid:	100% ED
LED functions	
Green:	Supply voltage on
Yellow:	Operating status
Red:	Error
Classification:	
Standards:	EN ISO 13849-1; IEC 61508; IEC 60947-5-3
PL:	up to e
Category:	up to 4
PFH value:	4,3 x 10^{-9} /h
SIL:	suitable for SIL 3 applications
Mission time:	20 years
Classification:	PDF-M

The latching force of the MZM 120 can be set in steps within a range of approx. 30 N (factory setting) to approx. 80 N. To this end, the adjustment target MZM 100 TARGET is used directly on the fitted MZM 120.

Ordering details

MZM 120① ST2-②RE-A

No.	Option	Description
①	B	Actuator monitored
	BM	Combined actuator detection and interlocking function
②	1P2PW2	1 diagnostic output and 2 safety outputs, all p-type with combined diagnostic signal: safety guard closed **and** can be locked
	SD2P	Serial diagnostic output and 2 safety outputs, p-type

Note

The safety sensor with interlocking function, the actuating unit and the adjustment target must be ordered separately!

Connection

Integrated connectors
M12, 8-pole
(Suffix -ST2)

Diagnostic

Depending on the component variant, the following diagnostic signals are transmitted:

1P2PW2-Variant:

OUT Combined diagnostic signal: safety guard closed **and** can be locked

Operating principle of the diagnostic output

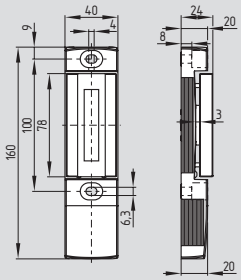
The short-circuit proof diagnostic output OUT can be used for central indicating or control functions, for instance in a PLC.

The diagnostic output is not a safety-relevant output!

The control category or PL to EN ISO 13849-1 obtained with these safety-monitoring modules does not only depend on the safety-monitoring module, but on the structure and layout of the entire safety circuit as well.

Detailed information about the use of serial diagnosis can be found in the mounting and wiring instructions of the SD Gateway and in the instructions for the integration of the SD Gateway.

Actuator MZM 120-B1

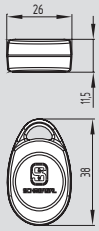


- Metal components with hygiene-compliant NEDOX® SF-2 coating
- Actuator free from play, i.e. neutralisation of undesired noises
- The magnetic interlocks and the actuator unit must be ordered separately!

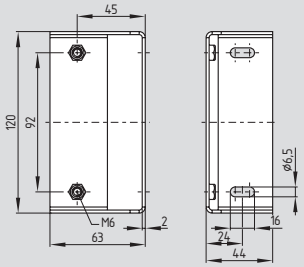
Approvals

Certification in combination with safety sensor under preparation

System components



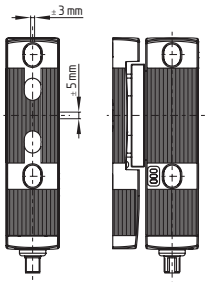
Adjustment target MZM 100 TARGET



Mounting kit MS MZM 100-W

Misalignment

Misalignment



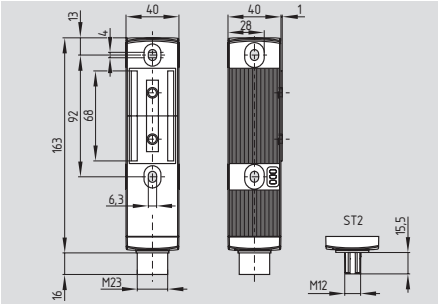
Ordering details

Actuator	**MZM 120-B1**

Ordering details

Adjustment target	**MZM 100 TARGET**
Mounting kit (powder-coated)	**MS MZM 100-W**

MZM 100



Solenoid interlock
(Solenoid interlock monitoring)

- Innovating and unique operating principle
- Accurate adjustment through slotted holes
- Power to lock principle
- Solenoid interlock must be used as end stop.
- Automatic latching with variable adjustment
- Latching force through permanent magnet approx. 30 N, also in de-energised condition
- Sensor technology permits an offset between actuator and interlock of ± 5 mm vertically and ± 3 mm horizontally
- Intelligent diagnostic signalling of failures
- 3 LED's to show the operating status
- Series-wiring of max. 31 components, without detriment to the category
- AS-Interface Safety at Work available

Approvals

Technical data

Standards:	EN 60947-5-1, IEC 60947-5-3, EN ISO 13849-1, IEC 61508
Enclosure:	glass-fibre reinforced thermoplastic, self-extinguishing
Mechanical life:	≥ 1 million operations (for guards ≤ 5 kg; actuating speed ≤ 0.5 m/s)
$F_{max.}$:	500 N
Protection class:	IP 67
Protection class:	II, ⧈
Overvoltage category:	III
Degree of pollution:	3
Connection:	connector M12 or M23
Series-wiring:	**max. 31 components**
Cable length:	max. 200 m (Cable length and cable section alter the voltage drop depending on the output current)
Ambient conditions:	
Ambient temperature:	−25 °C … +55 °C
Storage and transport temperature:	−25 °C … +85 °C
Relative humidity:	30% … 95%, non-condensing, no icing
Resistance to vibration:	10…150 Hz (0.35 mm/5 g)
Resistance to shock:	30 g / 11 ms
Switching frequency f:	1 Hz
Response time:	< 100 ms
Duration of risk:	< 100 ms
Time to readiness:	< 4 s
Electrical data:	
U_e:	24 VDC −15% / +10% (stabilised PELV)
Operating current:	max. 0.6 A plus current through the safety outputs
I_e:	1 A
I_0:	max. 0.6 A
U_{imp}:	800 V
U_i:	32 VDC
Fuse rating:	internally short-circuit proof
Device insulation:	to UL 508; depending on the number of components and loads (Y1, Y2 and OUT) Connector M12: ≤ 2 A Connector M23: ≤ 4 A

Technical data

Safety inputs X1 and X2:	
Voltage range – 3V … 5V:	Low
Voltage range 15V … 30V:	High, typically 4 mA at 24 V
Safety outputs Y1 and Y2:	p-type, short-circuit proof
U_{e1}:	0 V up to 4 V under Ue
I_{e1}:	max. 0.25 A
Utilisation category:	DC-13
Leakage current I_r:	≤ 0.5 mA
Diagnostic output OUT:	p-type, short-circuit proof
U_{e2}:	0 V up to 4 V under Ue
I_{e2}:	max. 0.05A
Utilisation category:	DC-13
Wiring capacitance for serial diagnostic:	max. 50 nF
Solenoid control IN:	
Voltage range – 3V … 5V:	Low
Voltage range 15V … 30V:	High, typically 10 mA at 24 V, dynamically 20 mA
Solenoid:	100% ED
LED functions	
Green:	Supply voltage on
Red:	Error
Yellow:	Operating status
Classification:	
Standards:	EN ISO 13849-1; IEC 61508; IEC 60947-5-3
PL:	up to e
Category:	up to 4
PFH value:	4.3 x 10-9 /h
SIL:	suitable for SIL 3 applications
Mission time:	20 years
Classification:	PDF-M

The latching force of the MZM 100 can be set in steps of approx. 10 N each within a range of approx. 30 N (factory setting) to approx. 100 N. To this end, the adjustment target MZM 100 TARGET is used directly on the fitted MZM 100.

Ordering details

MZM 100 ①-②③④-A

No.	Option	Description
①	ST	Connector M23, (8+1)-pole
	ST2	Connector M12, 8-pole
②	1P2PW	1 diagnostic output and 2 safety outputs, all p-type with combined diagnostic signal: safety guard closed and magnetic interlock locked
	SD2P	Serial diagnostic output and 2 safety outputs, p-type

Ordering details

MZM 100 ①-②③④-A

No.	Option	Description
③		Without latching
	RE *	Adjustable latching force approx. 30 … 100 N
④	M	Permanent magnet approx. 30 N

* "Adjustable latching force RE" certification under preparation

The solenoid interlock, the actuating unit and the adjustment target must be ordered separately!

A detailed product description can be found in the „Electronic Safety Sensors and Solenoid Interlocks" brochure.

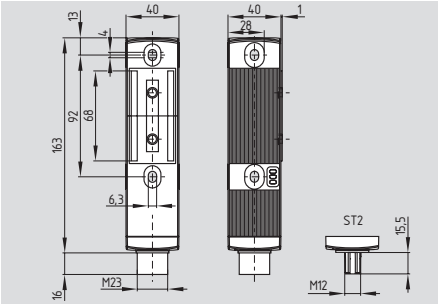
Connection

Integrated connectors

M23, (8+1)-pole (Suffix -ST)

M12, 8-pole (Suffix -ST2)

MZM 100 B



Safety sensor with interlocking function (Actuator monitoring)

- Innovating and unique operating principle
- Accurate adjustment through slotted holes
- Power to lock principle
- Safety sensor must be used as end stop.
- Automatic latching with variable adjustment
- Latching force through permanent magnet approx. 30 N, also in de-energised condition
- Sensor technology permits an offset between actuator and sensor of ± 5 mm vertically and ± 3 mm horizontally
- Intelligent diagnostic signalling of failures
- 3 LED's to show the operating status
- Series-wiring of max. 31 components, without detriment to the category
- AS-Interface Safety at Work available

Approvals

Technical data

Standards:	EN 60947-5-1, IEC 60947-5-3, EN ISO 13849-1, IEC 61508
Enclosure:	glass-fibre reinforced thermoplastic, self-extinguishing
Mechanical life:	≥ 1 million operations (for guards ≤ 5 kg; actuating speed ≤ 0.5 m/s)
$F_{max.}$:	500 N
Protection class:	IP 67
Protection class:	II, ⧈
Overvoltage category:	III
Degree of pollution:	3
Connection:	connector M12 or M23
Series-wiring:	**max. 31 components**
Cable length:	max. 200 m (Cable length and cable section alter the voltage drop depending on the output current)
Ambient conditions:	
Ambient temperature:	−25 °C … +55 °C
Storage and transport temperature:	−25 °C … +85 °C
Relative humidity:	30% … 95%, non-condensing, no icing
Resistance to vibration:	10…150 Hz (0.35 mm/5 g)
Resistance to shock:	30 g / 11 ms
Switching frequency f:	1 Hz
Response time:	< 100 ms
Duration of risk:	< 100 ms
Time to readiness:	< 4 s
Electrical data:	
U_e:	24 VDC −15% / +10% (stabilised PELV)
Operating current:	max. 0.6 A plus current through the safety outputs
I_e:	1 A
I_0:	max. 0.6 A
U_{imp}:	800 V
U_i:	32 VDC
Fuse rating:	internally short-circuit proof
Device insulation:	to UL 508; depending on the number of components and loads (Y1, Y2 and OUT) Connector M12: ≤ 2 A Connector M23: ≤ 4 A

Technical data

Safety inputs X1 and X2:	
Voltage range – 3V … 5V:	Low
Voltage range 15V … 30V:	High, typically 4 mA at 24 V
Safety outputs Y1 and Y2:	p-type, short-circuit proof
U_{e1}:	0 V up to 4 V under Ue
I_{e1}:	max. 0.25 A
Utilisation category:	DC-13
Leakage current I_r:	≤ 0.5 mA
Diagnostic output OUT:	p-type, short-circuit proof
U_{e2}:	0 V up to 4 V under Ue
I_{e2}:	max. 0.05A
Utilisation category:	DC-13
Wiring capacitance for serial diagnostic:	max. 50 nF
Solenoid control IN:	
Voltage range – 3V … 5V:	Low
Voltage range 15V … 30V:	High, typically 10 mA at 24 V, dynamically 20 mA
Solenoid:	100% ED
LED functions	
Green:	Supply voltage on
Red:	Error
Yellow:	Operating status
Classification:	
Standards:	EN ISO 13849-1; IEC 61508; IEC 60947-5-3
PL:	up to e
Category:	up to 4
PFH value:	4.3 x 10-9 /h
SIL:	suitable for SIL 3 applications
Mission time:	20 years
Classification:	PDF-M

The latching force of the MZM 100 B can be set in steps of approx. 10 N each within a range of approx. 30 N (factory setting) to approx. 100 N. To this end, the adjustment target MZM 100 TARGET is used directly on the fitted MZM 100 B.

Ordering details

MZM 100 B ①-②RE③-A *

No.	Option	Description
①	ST	Connector M23, (8+1)-pole
	ST2	Connector M12, 8-pole
②	1P2PW2	1 diagnostic output and 2 safety outputs, all p-type with combined diagnostic signal: safety guard closed **and** can be locked
	SD2P	Serial diagnostic output and 2 safety outputs, p-type
③	M	Permanent magnet approx. 30 N

* "Adjustable latching force RE" certification under preparation

Ordering details

The safety sensor with interlocking function, the actuating unit and the adjustment target must be ordered separately!

A detailed product description can be found in the „Electronic Safety Sensors and Solenoid Interlocks" brochure.

Connection

Integrated connectors

M23, (8+1)-pole (Suffix -ST)

M12, 8-pole (Suffix -ST2)

Safety controller

The control category or PL to EN ISO 13849-1 obtained with these safety-monitoring modules does not only depend on the safety-monitoring module, but on the structure and layout of the entire safety circuit as well.

Diagnostic

Depending on the component variant, the following diagnostic signals are transmitted:

1P2PW-Variant:

OUT Combined diagnostic signal: safety guard closed **and** magnetic interlock locked

1P2PW2-Variant:

OUT Combined diagnostic signal: safety guard closed **and** can be locked

Operating principle of the diagnostic output

The short-circuit proof diagnostic output OUT can be used for central indicating or control functions, for instance in a PLC.

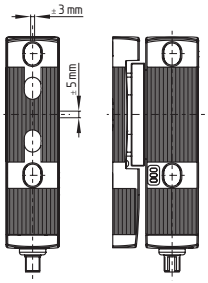
The diagnostic output is not a safety-relevant output!

Serial diagnostic

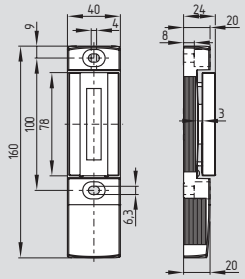
Detailed information about the use of serial diagnosis can be found in the mounting and wiring instructions of the SD Gateway and in the instructions for the integration of the SD Gateway.

Misalignment

Misalignment

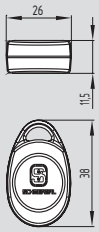


Actuator MZM 100-B1.1



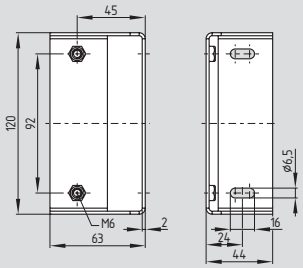
- The magnetic interlocks and the actuator unit must be ordered separately!
- Actuator free from play, i.e. neutralisation of undesired noises

MZM 100 TARGET



- Adjustment target for variable adjustment of the latching force of the MZM 100
- Gradually adjustable by steps of approx. 10 N each within the range from approx. 30 N to 100 N
- The adjustment target must be ordered separately

System components



Mounting kit MS MZM 100-W

Approvals

Approvals only in combination with switches MZM 100

Ordering details

Actuator **MZM 100-B1.1**

Ordering details

Adjustment target **MZM 100 TARGET**

Ordering details

Mounting kit **MS MZM 100-W**
(screws included in delivery)

SD-I-U- …

- **UNIVERSAL-Gateway** for the series-wiring of the diagnostic signals from safety switching components with integrated SD interface. Comprehensive status and diagnostic data from the SD components are transmitted to the control system through the field bus interface.
- Diagnostic lines of max. 31 safety switching components can be wired in series
- Series-wiring of different components enabled (CSS 34, RSS 36, AZM 200, MZM 100 etc.)
- Reduced wiring expenditure through the series-wiring of the safety channels and the diagnostic lines in the field
- Automatic addressing of the safety switching components in the SD interface
- IP20 component for quick-fix mounting onto standard DIN rails in the control cabinet

Available FIELD BUS interfaces:
- PROFINET IO
- EtherNet IP
- DeviceNet
- CC-Link
- CANopen

Technical data

Operating voltage:	24 VDC −15 %/+20 % (stabilised PELV)
Fuse rating:	external fuse 1 A slow-blow
Operating current at 24 VDC:	max. 500 mA, internally protected
Operating temperature range:	0 … 55 °C, in case of vertical positioning
Storage temperature range:	−25 °C … +70 °C
Climatic stress:	relative humidity 30 % … 85 %, non-condensing
Protection class:	IP20
Mounting location:	earthed lockable control cabinet with at least IP54 protection class
Resistance to vibrations: to IEC 60068-2-6	if fitted between two lateral clamping blocks on the rail 10 … 57 Hz / 0.35 mm and 57 … 150 Hz / 5 g
Restistance to shock to IEC 60068-2-29:	10 g
EMC rating:	
to EN 61000-4-2 (ESD)	±6 kV contact discharge / ±8 kV Air discharge
to EN 61000-4-3 (HF field)	10 V/m / 80 % AM
to EN 61000-4-4 (Burst)	±1 kV all connections
to EN 61000-4-5 (Surge)	±1 kV all connections
to EN 61000-4-6 (HF cables)	10 V all connections
EMC interfering radiation: to EN 61000-6-4 (2002)	industrial interfering radiation
Rated insulation voltage U_i:	32 V
Rated impulse withstand voltage U_{imp}:	0.5 kV
Overvoltage category:	II
Degree of pollution:	2
Dimensions (W x H x D):	30 x 100 x 80 mm (= mounting height starting from rail)

Approvals

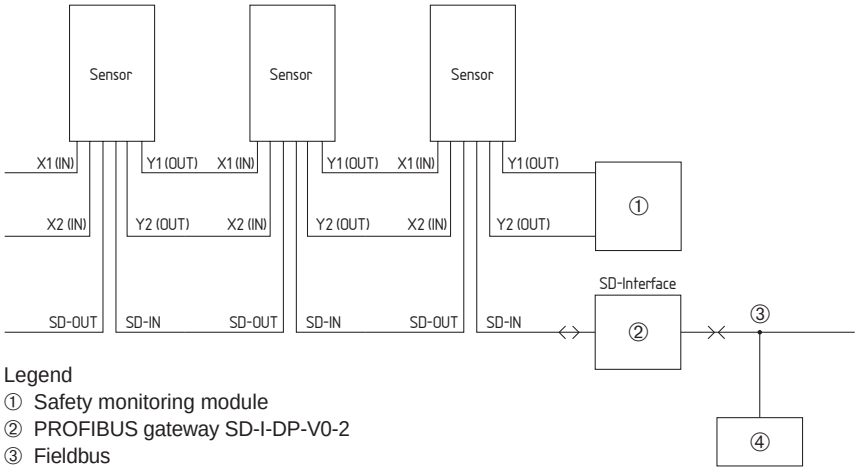
CE

Ordering details

SD-I-U-①

No.	Option	Description
①	PN	PROFINET IO
	EIP	EtherNet IP
	DN	DeviceNet
	CCL	CC-Link
	CAN	CANopen

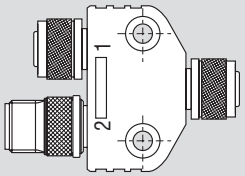
Wiring diagram

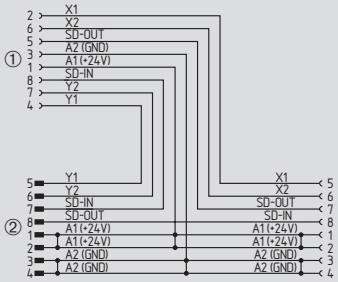


Legend
① Safety monitoring module
② PROFIBUS gateway SD-I-DP-V0-2
③ Fieldbus
④ PLC

Innovations 2010/2011 - Y-adapter for series-wiring of SD components

Y-adapter CSS-Y-8P





- Enables the series-wiring of sensors and solenoid interlocks with SD interface. To that effect, both the safety channels and the serial diagnostic lines are wired in series.
- Sensors and interlocks with conventional diagnostic output can also be wired in series, though in this configuration, the diagnostic outputs are not evaluated.

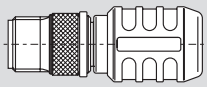
Approvals

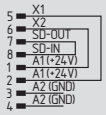
CE

Ordering details

Y-adapter **CSS-Y-8P**

Terminal connector





- Supplies the safety channels with operating voltage
- Leads the SD interface back to the control cabinet to connect further SD participants of other safety circuits
- For the wiring, M12 cable extensions can be used. The voltage drop (due to the cable length, cable section, voltage drop per sensor) should be taken into account, as it reduces the maximum number of safety sensors and interlocks with SD interface that can be wired in series.

Approvals

CE

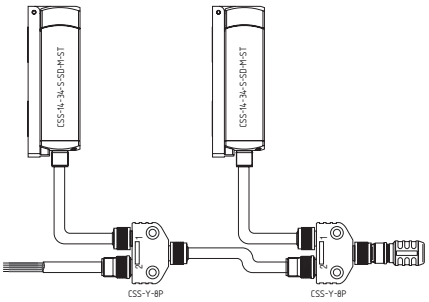
Ordering details

Terminal connector **CSS-Y-A-8P**

Technical data

Rated operating voltage of the SD devices:	24 VDC (−15%/+10%)
Rated operating voltage of the adapter:	30 VDC
Max. operating current of the device to be connected:	1 A
Fuse of the connecting cables (circuit breaker):	4 A
Ambient temperature T_u:	−25 °C ... +75 °C

Wiring diagram



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For detailed information, check out
www.schmersal.com

Safety-monitoring modules and safety controllers

- PROTECT-SELECT _____ Page 26
- PROTECT-SELECT WL _____ Page 28
- SRB 301MA _____ Page 30
- PROTECT-PE _____ Page 32

The Schmersal Group has completed its safe signal evaluation product portfolio with the following components:

- PROTECT-SELECT, a safe compact controller, suitable for up to 9 safety functions, offering the advantage that the desired safety programme does not have to be programmed by the user; instead of that, a typical programme simply can be chosen from the included programme library. The customer-specific PROTECT-OEM variant is supplied with a preconfigured personalised safety programme.
- PROTECT-SELECT WL (or PROTECT-OEM WL) is identical to the above-described compact safety controller, however extended with a function enabling the integration of the safe radio signal from a mobile hand-held command device in the entire safety function.
- SRB 301MA completes the range of safety-monitoring modules for standard applications from the Schmersal Group for the cost-sensitive “low comfort” segment. This component monitors the “trailing edge” of the reset signal during the start-up procedure, in accordance with the requirements of ISO EN 13849-1.
- PROTECT-PE is an input expander module for all commonly used safety-monitoring modules, to which up to 4 sensors, e.g. all popular safety switches (with or without potential) can be connected. Optimal diagnostic functions are provided to the user by a signalling output for every sensor as well as a group signal related to all connected sensors.

PROTECT-SELECT / -OEM

The PROTECT-SELECT compact safety controller is a particularly user-friendly small safety controller, by means of which the user can realise up to 9 safety functions. In this way, the discrete set-up of an application with safety-monitoring modules can be quickly and smoothly circumvented.

Compared to safety-monitoring modules, safety controllers offer a higher level of flexibility. They can be optimally adapted to the specific requirements and therefore enable an enhanced integration of the safety technology in the machine processes and the work cycles of the operator in actual practice.
An essential feature here is the free allocation and linkage of the input signals to the safety outputs, besides other possibilities such as setting an individual drop-out delay for a specific safety output.

Target: setting-up programmes without programming

During the development of the new PROTECT-SELECT compact safety controller, the objective was to offer the machine builder the possibilities of a conventional small safety controller without the user needing to know the manufacturer-specific parameter settings or to master a programming language.

This objective is achieved by a new kind of programme set-up. The user can select the most suitable programme for his application from a number of hands-on programmes. This selection is made directly on the component. The relevant programme is selected on the display by means of toggle switches.

The 12 available programmes are clearly described in the user manual. In this way, PROTECT-SELECT can be wired similar to a safety-monitoring module by means of a user manual. The second task of the display consists in providing the user with comprehensive diagnostic information directly on the component.

Application-specific parameters and characteristic variables such as the destination of the sensor signal at the corresponding input (with or without potential) or a required drop-out delay at a particular output can be allocated through a dialogue function on the display. The de-bouncing durations, which are required on vibration-sensitive safety guards to enable the start-up procedure only when the contacts are in a stable condition, can be individually adjusted and allocated to the input as well.

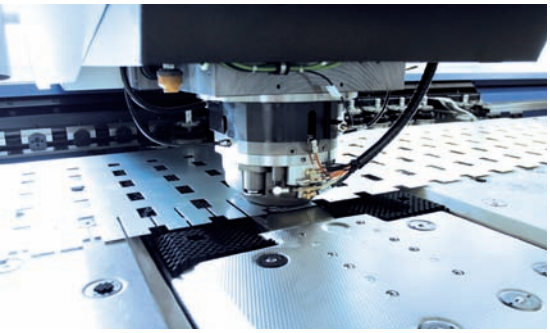
Safe evaluation of two analogue input signals

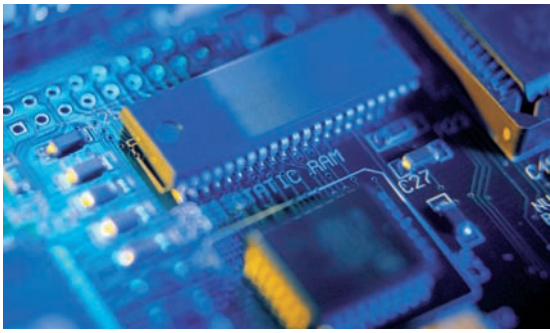
A particularly significant feature of the new PROTECT-SELECT compact safety controller is the safe evaluation of two analogue input signals. Through another dialogue function on the display, an individual voltage or current threshold value of an analogue input signal can be assigned within the conventional range (0 … 10 V; 4 … 20 mA). Through the definition of each time two upper and lower threshold values, up to two ranges for the analogue input signal can be defined. Derogations from the defined range then are accordingly processed in the safety programme. It is also possible to compare both analogue input signals.

Each individual analogue input can be used in applications up to PL d to EN ISO 13849-1.

PROTECT-SELECT has two safe relay outputs (250 VAC / 6 A; 24 VDC / 6 A) and four safe semi-conductor outputs (24 VDC / 1.8 A). To ensure a high protection against cross-wire shorts of the actuators, the common +24 VDC voltage as well as the earth potential in a second switch-off channel is switched through two safe semi-conductor outputs so that the minus and plus connection of the actuator are safely separated when solicited. As a result, minor mass displacements of the actuators with undefined voltage spikes or buffered residual voltages in the actuator do not affect the safety level.

When paired, all 18 safe digital inputs, four safe semi-conductor outputs and two safe relay outputs meet the requirements for PL e to EN ISO 13849-1.





Versatile applications

PROTECT-SELECT can evaluate the signal of all conventional sensors, e.g. emergency stop command devices, safety guard monitors, door locking devices, tactile as well as optoelectronic monitoring devices. With its mounting width of only 52.5 mm, the new compact controller requires only little space in the control cabinet.

Individually configurable versions for OEM customers

Besides the basic version of PROTECT SELECT, in which the user can choose from a number of preconfigured programmes, another version is available as well: PROTECTOEM. For this version, a customer-specific programme is set up together with the user and implemented into the compact safety controller.

An individual article number as well as a customer-specific name is allocated to the PROTECT-OEM. The user does not need to perform any parameter setting anymore. In this way, the additional functions desired by the customer can also be perfectly realised.

PROTECT-SELECT Version

- 12 standard safety programmes selectable through a password-protected selection menu.
- Suitable for up to 9 safety functions
- Programme selection through toggle switches

PROTECT-OEM Version

- 1 or more customer-specific safety programme(s)

Common features

- Advantage: no programme transmission or programming knowledge required
- Status information through display
- 3 basic information through LED's
- Compact enclosure: width × height x depth: 52.5 x100 x118 mm
- Plug-in cage clamps
- Individual programme adaptations: application-specific I/O configuration such as drop-out delays, de-bouncing times or cross-wire short monitoring can be set through the menu. Advantage: machine-specific parameters are accurately set.
- p- + n-type semi-conductor outputs: increased cross-wire short protection. Both the voltage supply (24 VDC) and the reference potential (0 V) are safely switched off. Advantage: safe switch-off of "problematic" actuators, e.g. in case of earth potential displacement.
- Safe analogous inputs: advantage: process-critical parameters (temperature, pressure, flow, etc.) can be integrated in the safety concept of the plant through individual threshold value setting (range)

Technical data

PROTECT-SELECT / -OEM

- 18 single-channel or optionally 9 dual-channel digital safety inputs (PL e to EN ISO 13849-1)
- 2 single-channel analogous safety inputs, 0 … 10 V, 4 … 20 mA (PL d to EN ISO 13849-1)
- 2 single-channel or optionally 1 dual-channel p-type safety semi-conductor output and 2 p- and n-type dual-channel semi-conductor outputs (24 VDC / 1.8 A, PL e to EN ISO 13849-1)
- 2 single-channel or optionally 1 dual-channel safety relay output 50 V / 6 A; PL e to EN ISO 13849-1)
- 4 single-channel signalling outputs (0.1 A); together with safety inputs
- 3 cyclic outputs (0.1 A)
- Status and diagnosis through OLED display
- Status of the inputs and outputs
- Plain text error messages
- Programme selection through toggle switches, input of additional functions also through toggle switches
- LED's for UB, RUN, ERROR
- Dimensions: width x height x depth: 52.5 × 100 × 118 mm
- PL e (EN ISO 13849-1); SIL 3 (IEC 62061)

PROTECT-SELECT WL / -OEM WL

When extended with a “radio module”, the PROTECT-SELECT WL variant of the PROTECT-SELECT compact safety controller enables the wireless integration of a mobile hand-held command device in the safety concept of the control.

2 safe and 15 operational radio signals

Besides a safe emergency stop command device, an independent safe operating element, i.e. the enabling switch, is located on the side of the mobile element. In this way, both safety functions can be integrated in the control process of the PROTECT-SELECT compact safety controller as if they were wired.

The mobile element has a membrane keyboard for 15 operational signals. Due to the ergonomic design of the mobile receiver and transmitter unit, any button of the membrane keyboard can be simultaneously pushed with the pointer of the enabling switch and the thumb of the same hand. The “radio module” of the compact safety controller has 9 operational inputs and 15 operational outputs. In this way, an operational output can be allocated to every button of the membrane keyboard.

Clear overview on the display

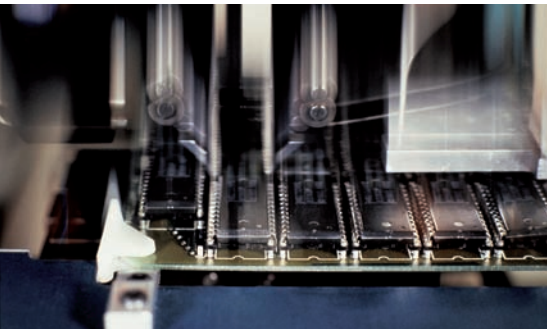
The operational inputs basically are used to read back the externally switched signals into the controller, transmit them to the mobile element and display them as information on the display. The bidirectional radio link has been developed especially for these tasks.
Besides the information, which is typical to the wireless transmission and reception operation, such as reception quality and battery status, the display can also show all statuses of the inputs and outputs of the PROTECT-SELECT WL compact safety controller. In this way, the user is always informed about the current status of the system.

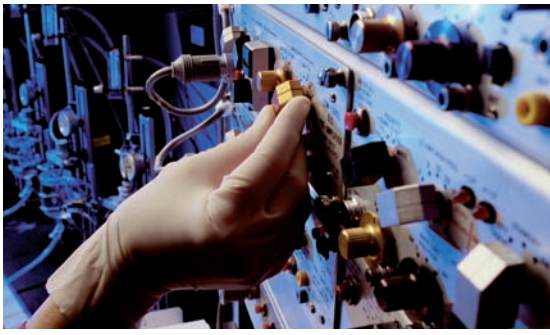
Optimal radio transmission through extendable antenna concept

The antenna concept of PROTECT-SELECT WL has been designed to fully cover the walkable space even under the roughest radio transmission conditions. So-called detached transceivers, which are linked to the base unit by means of fibre-optic cables, can be positioned so that the optimal reception of the data, which are sent through the world-wide public domain wave band of 2.4 HGz, is ensured.
If necessary, more transceivers can be allocated in the system loop.

Also available as OEM version

Besides the basic version PROTECT-SELECT WL with preconfigured programmes, a second version is available as well: the PROTECT-OEM WL. In this version, customer-specific programme is set up together with the user and implemented into the compact safety controller. An individual article number as well as a customer-specific name is allocated to the PROTECT-OEM. The user does not need to perform any parameter setting anymore. In this way, the additional functions desired by the customer can also be perfectly realised.





PROTECT-SELECT WL version

- 15 standard safety programmes selectable through password-protected selection menu.

PROTECT-SELECT WL/OEM version

- 1 or more customer-specific safety programme(s)

Common features

- Refer to PROTECT-SELECT, additionally with radio connection with transceiver through fibre-optic cables, 9 operational inputs and 15 operational outputs

Technical data

PROTECT-SELECT WL / -OEM base unit

- 18 single-channel or optionally 9 dual-channel digital safety inputs (PL e to EN ISO 13 849-1)
- 2 single-channel analogous safety inputs, 0 … 10 V, 4 … 20 mA (PL d to EN ISO 13849-1)
- 2 single-channel or optionally 1 dual-channel p-type safety semi-conductor output and 2 dual-channel p- and n-type safety semi-conductor outputs (24 VDC/1.8 A, PL e to EN ISO 13 849-1)
- 2 single-channel or optionally 1 dual-channel safety relay output (250V/6A; PL e to EN ISO 13849-1)
- 4 single-channel signalling outputs (0.1 A); together with safety inputs
- 3 cyclic outputs (0.1 A)
- Status and diagnosis through OLED display;
- Status of the inputs and outputs
- Plain text error messages
- LED's for UB, RUN, ERROR
- PL e (EN ISO 13 849-1); SIL 3 (IEC 62 061)
- 9 operational inputs (status signal at mobile element)
- 15 operational outputs
- Bidirectional radio link
- Free channel allocation: automatic or manual
- Number of radio channels: 16

Mobile element

- Number of safety functions: 2 (emergency stop and enabling)
- Number of operational functions: 15
- Status information through display
- All mobile element with spare battery – concept with standard battery (AA type)
- Antenna concept: (multiple) transceivers, permanently connected to the base unit through fibre optics, optimal coverage of critical spaces
- Transmission frequency 2.4 GHz (worldwide available)

SRB 301MA

- Suitable for signal processing of emergency stop command devices, interlocking devices, outputs connected to potentials and magnetic safety switches
- 1 or 2 channel control
- 3 safety contacts, STOP 0
- 1 additional acknowledgement output
- Reset function with trailing edge
- Optionally with short-circuit recognition (through switch)
- 4 LEDs to show operating conditions

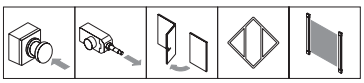
Technical data

Standards:	IEC/EN 60204-1; EN 60947-5-1; EN ISO 13849-1; IEC 61508
Start conditions:	Start button (monitored)
Feedback circuit (Y/N):	yes
ON delay with reset button:	typ. 15 ms
Drop-out delay in case of emergency stop:	≤ 15 ms
Drop-out delay on „supply failure“:	typ. 80 ms
Rated operating voltage U_e:	24 VDC –15%/+20%, residual ripple max. 10%; 24 VAC –15%/+10%
Frequency range:	50 / 60 Hz
Fuse rating for the operating voltage:	Internal electronic protection, tripping current > 500 mA, reset after approx. 1 sec
Internal electronic protection (Y/N):	yes
Power consumption:	1.8 W; 4.4 VA
Monitored inputs:	
- Short-circuit recognition:	optional
- Wire breakage detection:	yes
- Earth connection detection:	yes
Number of NC contacts:	2
Number of NO contacts:	0
Max. conduction resistance:	max. 40 Ω
Outputs:	
Stop category:	0
Number of safety contacts:	3 (13-14; 23-24; 33-34)
Number of auxiliary contacts:	1 (41-42)
Max. switching capacity of the safety contacts:	230 VAC, 8 A ohmic (inductive in case of appropriate protective wiring); min. 10 V, 10 mA
Max. switching capacity of the auxiliary contacts:	24 VDC, 2 A
Utilisation category to EN 60947-5-1:	AC-15: 230 V / 6 A DC-13: 24 V / 6 A
Fuse rating of the safety contacts:	8 A slow blow
Fuse rating of the auxiliary contacts:	2 A slow blow
Mechanical life:	10 million operations
Ambient conditions:	
Ambient temperature:	– 25 °C … + 60 °C
Storage and transport temperature:	– 40 °C … + 85 °C
Protection class:	Enclosure: IP40, Terminals: IP20, Clearance: IP54
Mounting:	Snaps onto standard DIN rail to EN 60715
Connection type:	Screw terminals
- min. cable section:	0.25 mm²
- max. cable section:	2.5 mm²
Weight:	250 g
Dimensions (Height x Width x Depth):	100 x 22.5 x 121 mm

Approvals

Ordering details

SRB 301MA



Classification

Safety parameters:

Standards:	EN ISO 13849-1, IEC 61508, EN 60947-5-1
PL:	STOP 0: up to e
Category:	STOP 0: up to 4
PFH value:	STOP 0: ≤ 2,00 x 10^{-8}/h
SIL:	STOP 0: up to 3
Mission time:	20 years

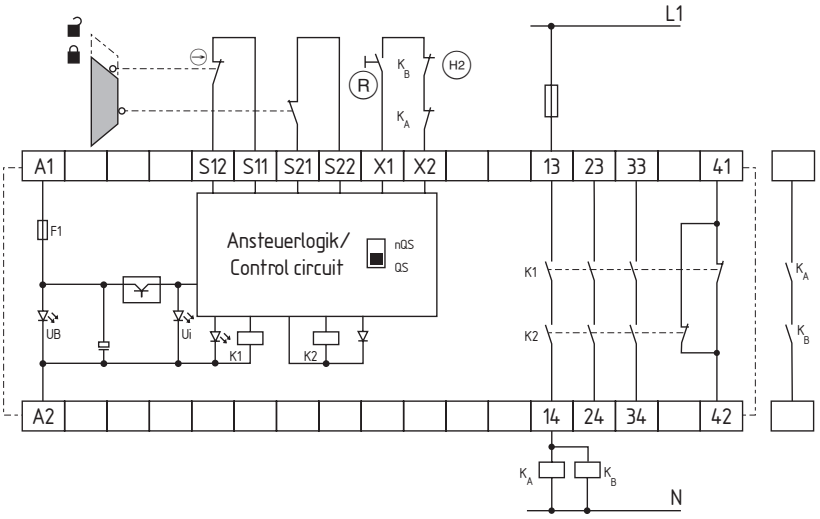
The PFH value of 2.00 x 10^{-8}/h applies to the combinations of contact load (current through enabling contacts) and number of switching cycles (n-op/y) mentioned in the table below. At 365 operating days per year and a 24-hours operation, this results in the below-mentioned switching cycle times (t-cycle) for the relay contacts.
Diverging applications upon request.

Contact load	n-op/y	t-cycle
20 %	525,600	1.0 min
40 %	210,240	2.5 min
60 %	75,087	7.0 min
80 %	30,918	17.0 min
100 %	12,223	43.0 min

Note

- Monitors a guard door to PL e and category 4.
- Input level: The example shows a 2-channel control of a guard door monitoring with two position switches, whereof one with positive break, external reset button Ⓡ and feedback circuit Ⓗ2.
- The feedback circuit monitors the position of the contactors Ka and Kb.
- Switch setting:
  The cross-wire short detection function (factory default) is programmed by means of the switch located underneath the front cover of the module:
  Position nQS (top):
  no cross-wire short protection, suitable for 1-channel applications and applications with outputs with potential in the control circuits.
  Position QS (bottom):
  cross-wire short protection, suitable for 2-channel applications without outputs with potential in the control circuits.
- For 1-channel control, connect NC contact to S11/S12 and bridge S12/S22 (QS-switch = nQS)
- Connect potential p-type outputs of safety light grids/curtains to S12/S22. The devices must have the same reference potential. (QS-switch = nQS)
- Inductive loads (e.g. contactors, relays, etc.) are to be suppressed by means of a suitable circuit.

Wiring diagram



LED

The integrated LEDs indicate the following operating states.

- Position relay K1
- Position relay K2
- Supply voltage U_B
- Internal operating voltage U_i

Note

- The wiring diagram is shown with guard doors closed and in de-energised condition.

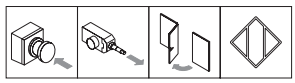
PROTECT-PE

- Possibility to connect up to 4 sensors per interface, e.g. safety magnetic switches of the BNS type, emergency stop control devices, interlocking devices, etc.
- Wiring of up to 4 sensors per interface with signals connected to the potential possible, e.g. CSS products from Schmersal and AOPD's (only PROTECT-PE-02).
- Current and voltage limitation of the input circuits
- Connection of sensors with 2 NC contacts (PROTECT-PE-02) or of sensors with NC/NO contacts (PROTECT-PE-11)
- Cross-wire monitoring of the input circuits (only PROTECT-PE-02)
- Signalling output for each sensor (monitoring of both circuits of one sensor) and of all sensors (Y5, summation signal)
- Signalling output 32-33, 33-34
- Cascading possible for the connection of up to 80 sensors
- Width 65,5 mm
- 6 LED to show operating conditions
- Cage clamps or plug-in screw terminals (ordering suffix -SK)
- With antivalent output contacts, ordering suffix -AN

Technical data

Standards:	IEC/EN 60204-1; EN 60947-5-1; EN ISO 13849-1; IEC/EN 61508
Start conditions:	automatic
Feedback circuit (Y/N):	no
ON delay with automatic start:	typ. 10 ms
Drop-out delay in case of emergency stop:	≤ 10 ms
Drop-out delay on „supply failure“:	≤ 60 ms
Rated operating voltage U_e:	24 VDC –15%/+20%, residual ripple max. 10%
Fuse rating for the operating voltage:	Internal electronic trip, tripping current > 300 mA
Internal electronic protection (Y/N):	yes
Power consumption:	max. 1.7 W; plus signalling outputs
Monitored inputs:	
- Short-circuit recognition:	PROTECT-PE-11: option; PROTECT-PE-02: yes
- Wire breakage detection:	yes
- Earth connection detection:	yes
Number of NC contacts:	PROTECT-PE-11: 1; PROTECT-PE-02: 2
Number of NO contacts:	PROTECT-PE-11: 1; PROTECT-PE-02: 0
Outputs:	
Stop category:	0
Number of auxiliary contacts:	2 (13-14; 23-24)
Number of signalling outputs:	7 (Y1-Y5; 32-33; 33-34)
Max. switching capacity of the safety contacts:	24 V, 2 A ohmic (inductive in case of appropriate protective wiring)
Max. switching capacity of signalling outputs:	24 VDC, 100 mA
Utilisation category to EN 60947-5-1:	DC-13
Fuse rating of the safety contacts:	2 A slow blow
Fuse rating of the signalling outputs:	Internal electronic trip, tripping current > 750 mA
Mechanical life:	10 million operations
Ambient conditions:	
Ambient temperature:	−25 °C … +55 °C
Storage and transport temperature:	−25 °C … +70 °C
Protection class:	Enclosure: IP20, Terminals: IP20, Clearance: IP20
Mounting:	Snaps onto standard DIN rail to EN 60715
Connection type:	Cage clamps or ordering suffix -SK: plug-in screw terminals
- min. cable section:	Cage clamps: 0.08 mm²; Plug-in screw terminals: 0.14 mm²
- max. cable section:	Cage clamps: 2.5 mm²; Plug-in screw terminals: 1.5 mm²
Weight:	160 g
Dimensions (Height x Width x Depth):	126 x 48 x 43 mm

Approvals



Ordering details

PROTECT-PE-①-②

No.	Option	Description
①	02	Connection of sensors with 2 NC contacts
	11	Connection of sensors with NC/NO contacts
	11-AN	Connection of sensors with NC/NO contacts and antivalent output contacts
②		Cage clamps
	SK	Plug-in screw terminals

Classification

Safety parameters:

Standards:	EN ISO 13849-1, IEC 61508, EN 60947-5-1
PL:	STOP 0: up to d
Category:	STOP 0: up to 3
PFH value:	STOP 0: 2.00 x 10^{-7}/h
SIL:	STOP 0: up to 2
Mission time:	20 years

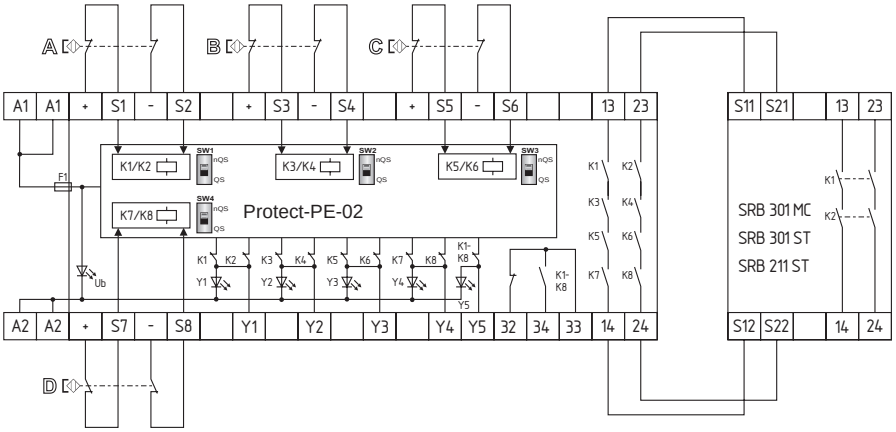
The PFH value of 2.00 x 10^{-7}/h applies to the combinations of contact load (current through enabling contacts) and number of switching cycles (n-op/y) mentioned in the table below. At 365 operating days per year and a 24-hours operation, this results in the below-mentioned switching cycle times (t-cycle) for the relay contacts. Diverging applications upon request.

Contact load	n-op/y	t-cycle
20 %	525,600	1.0 min
40 %	210,240	2.5 min
60 %	75,087	7.0 min
80 %	30,918	17.0 min
100 %	12,223	43.0 min

Note

- Start level:
  Depends on the wiring of the safety relay module.
- Sensor level:
  Dual-channel control of magnetic safety switches according to IEC 60947-5-3.
- Output level:
  Dual-channel control of a downstream safety relay module.
- Cross-shorts, wire breakage and earth leakage in the control circuits are detected.
- If the inputs S1, S3, S5 and S7 are not used, they have to be bridged to plus.
- If the inputs S2, S4, S6 and S8 are not used, they have to be bridged to minus.
- The safety relay modules must be suitable signal processing for single or dual-channel floating NC-contacts.
- Start and actuator configuration has to be effected in accordance with the data sheet.
- The obtainable performance level and category according to EN ISO 13849-1 depends on type and wiring of the used safety relay module.

Wiring diagram



LED

- LED's or signalling outputs signalise an opened protective device or emergency stops.
- Monitoring effected on both contact circuits of the sensor.
- When the protective device or the emergency stop circuit is opened a signal of 24 V will be wired the regarding output (Y1…Y5) and the dedicated LED lights.
  The integrated LEDs indicate the following operating states.
  - Position relay K1
  - Position relay K2
  - Position relay K3
  - Position relay K4
  - Internal operating voltage U_i

Note

The wiring diagram is shown with guard doors closed and in de-energised condition.

Inductive loads (e.g. contactors, relays, etc.) are to be suppressed by means of a suitable circuit.

Up-to-date without fail.
The online product catalogue

For detailed information, check out
www.schmersal.net

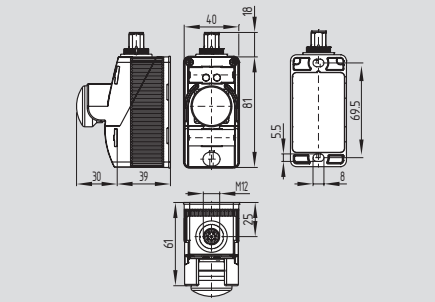
Control panels BDF

- BDF 100 _____ Page 36
- BDF 200 _____ Page 40

Every safety guard of a machine or plant is, besides a safety switching system, equipped with a control panel, by means of which the operator can activate for instance the emergency stop, on/off and reset functions. Usually, these control panels are manufactured by the machine builder according to the “do-it-yourself” principle. Especially for small quantities or in companies with their own auxiliary equipment production department, which only manufacture small series, this is a highly uneconomical operation, which does not always produce the desired result from the technical or aesthetical point of view.
The Schmersal Group felt a need for standardisation in this field and therefore has developed a modular system of control panels, which can be configured according to the user’s needs. The system is flexible and has an ergonomic design.
Together with the safety switching systems from the Schmersal Group, the BDF series forms a complete system for the safety at the safety guard, including the necessary operating elements.

For the development of the BDF series, the competencies from the Schmersal subsidiary Elan were used. The control elements with modular structure originate from the Elan programme. When combined especially with solenoid interlocks, the operating panel offers a large field of application. As the ergonomic aspect is regarded, the operating panel is optimally adapted to the new generation of the AZ 200 safety switches and the AZM 200 solenoid interlocks.

BDF 100 ...-NH



- **Yellow enclosure cover**
- Slim, shock-resistant plastic enclosure
- Can be fitted onto customary aluminium profile systems
- Can be installed in the most favourable ergonomic position
- Emergency stop function with or without protective collar
- Two-layer plastic identification labels can be used (engravements on request)

Approvals

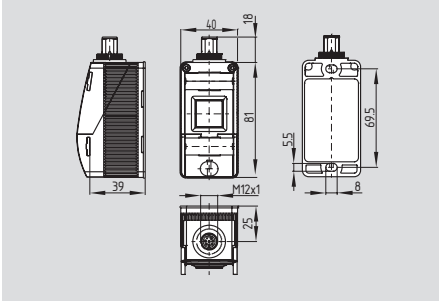
cULus under preparation CE

Ordering details

BDF 100-①-G-ST with emergency stop

No.	Option	Description
①	NH	Emergency stop latching pushbutton without protective collar
	NHK	with protective collar

BDF 100



- **Black enclosure cover**
- Comprehensive selection of illuminated pushbuttons, selector switches, signalling devices with LED and key-operated switches
- Start/stopp and reset functions available

Approvals

cULus under preparation CE

Ordering details

BDF 100-①-②-ST

No.	Option	Description
①	20	2 NO contacts
	11	1 NO / 1 NC contact
②	...	Selection of the operating element

Technical data

Standards:	EN 60947-5-1, EN 60947-5-5
Enclosure:	
Enclosure material:	glass-fibre reinforced thermoplastic, self-extinguishing
Enclosure protection class:	IP65
Connection:	Connector M12, 8-pole
Ambient conditions:	
Ambient temperature:	−25 °C ... +65 °C
Climatic resistance:	to DIN EN 60068, Part 2 - 30
Overvoltage category:	III
Degree of pollution:	3
Contact elements:	
Contact material:	AgNi 10, gold-plated
Control elements - protection class:	IP65
Rated operating voltage U_r:	max. 24 V
Utilisation category:	AC-15/DC-13
Rated operating current/voltage I_e/U_e:	AC-15: 2 A / 24 VAC DC-13: 1 A / 24 VDC
Thermal test current I_{the}:	2.5 A
Fuse rating:	2.5 A slow-blow
Contact system:	cross-point system
Contact force:	0.5 N per contact point = 1 N per contact
Switching of low voltages:	min. 5 V / 1 mA
Switching frequency:	1,200 s/h
Rated insulation voltage U_i:	60 V
Bounce time:	< 2 ms at 100 mm/s operating speed
Mech. lifetime:	1 million operations
Switch travel:	approx. 3 mm
Resistance to shocks:	100 g / 6 ms
Resistance to vibrations:	20 g, 10 ... 200 Hz
Wiring labels:	to DIN EN 50005 or DIN EN 50013
Actuating force at end of travel (1NC/1NO):	8 N

Note

Example: **BDF 100-NHK-G-ST**
BDF 100-11-LTWH-ST

The description of the suitable control elements can be found as of page **38**.

Technical data

Illuminated pushbuttons:

Enclosure material:	glass-fibre reinforced thermoplastic, self-extinguishing
Illuminated pushbutton material:	all-insulated
Front collar material:	plastic
Calotte material:	plastic
Illuminated pushbutton - protection class:	IP65
Rated operating voltage U_r:	max. 24 V
Fuse rating:	2.5 A slow-blow
Rated insulation voltage U_i:	60 V
Wiring labels:	to DIN EN 50005 or DIN EN 50013: X1/X2

Lamp values illuminated pushbutton:

Lamp fitting:	Ba5S
LED replacement:	from front

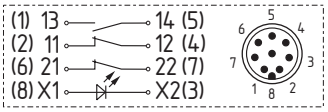
Safety classification emergency stop command device:

Standards:	EN ISO 13849-1
B_{10d}:	100,000
Mission time:	20 years

$$MTTF_d = \frac{B_{10d}}{0{,}1 \times n_{op}} \qquad n_{op} = \frac{d_{op} \times h_{op} \times 3600\ s/h}{t_{cycle}}$$

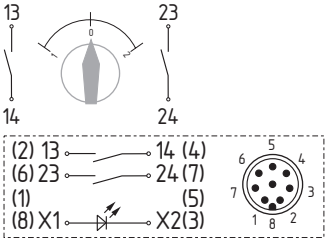
Contact variants

Emergency stop - 1 NO / 2 NC contacts

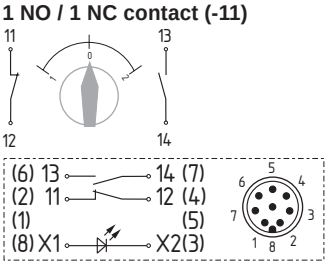


Contact variants

2 NO contacts (-20)



1 NO / 1 NC contact (-11)



Note

Contact symbols shown in non-actuated condition

Note

Pin configuration of the connector indicated between brackets

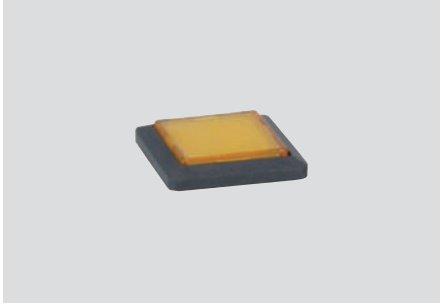
NH / NHK

- **Emergency stop latching pushbutton**
- Mushroom-shaped plastic pushbutton, Ø 30 mm
- Pull to reset
- 1 NO contact / 2 NC contacts
- Without protective collar: ordering suffix **NH**
- With protective collar: ordering suffix **NHK**

DT..

- **Pushbutton**
- With concave button
- Contact surface 19 x 19 mm
- 2 NO contacts or 1 NO/1 NC contact
- Available in 6 different colours
- Prints on device on request
- Ordering suffix, refer to table below

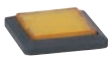
LM..



- **Signalling device**
- Illuminated surface 19 x 19 mm
- Lamp replacement from front
- Available in 5 different colours
- Prints on device on request
- Ordering suffix, refer to table below

LT..

- **Illuminated pushbutton**
- With concave button
- Contact surface 19 x 19 mm
- 2 NO contacts or 1 NO/1 NC contact
- Lamp replacement from front
- Available in 5 different colours
- Prints on device on request
- Ordering suffix, refer to table below

Suffix		yellow	red	green	blue	black	white
	Pushbutton DT..	DT**YE**	DT**RD**	DT**GN**	DT**BU**	DT**BK**	DT**WH**
	Illuminated pushbutton LT..	LT**YE**	LT**RD**	LT**GN**	LT**BU**		LT**WH**
	**Signalling device LM..**	LM**YE**	LM**RD**	LM**GN**	LM**BU**		LM**WH**

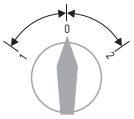
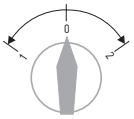
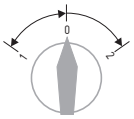
Innovations 2010/2011 - Control panel BDF 100

W..0

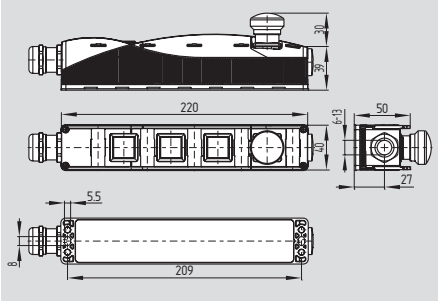
- **Selector switch / Spring-return selector switch**
- Version with standard knob, anthracite grey
- Ordering suffix, refer to table below

SW.20

- **Key-operated selector switch / Spring-return selector switch**
- Version with high-grade cylinder lock, therefore IP65 as well
- Ordering suffix, refer to table below

Ordering suffix	Selector switch	Selector switch	Spring-return	Spring-return	Selector switch
					
	1 latching position	2 latching positions left and right of the zero position	1 touch position and automatic return to the zero position	2 touch positions left and right of the zero position and automatic return to the zero position	1 touch position right and automatic return to the zero position + 1 latching position left of the zero position
	2 NO contacts or 1 NO/1 NC contact	1 NO contact for each switching position or 1 NC contact (position 1) and 1 NO contact (position 2)	2 NO contacts or 1 NO/1 NC contact	1 NO contact for each switching position or 1 NC contact (position 1) and 1 NO contact (position 2)	1 NO contact for each switching position or 1 NC contact (position 1) and 1 NO contact (position 2)
Standard knob	**WS20**	**WS30**	**WT20**	**WT30**	**WTS30**
Key-operated switch	**SWS20**		**SWT20**		

BDF 200



- Slim, shock-resistant plastic enclosure
- Can be fitted onto customary aluminium profile systems
- Can be installed in the most favourable ergonomic position
- Comprehensive selection of illuminated pushbuttons, selector switches, signalling devices with LED, key-operated switches and emergency stop switches/pushbuttons
- Emergency stop, start/stopp and reset functions available
- The position of the switch/pushbutton on the control panel can be chosen
- Two-layer plastic identification labels can be used (engravements on request)
- AS-Interface Safety at Work available

Approvals

under preparation

Technical data

Standards:	EN 60947-5-1, EN 60947-5-5
Enclosure:	
Enclosure material:	glass-fibre reinforced thermoplastic, self-extinguishing
Enclosure protection class:	IP 65
Cable entry:	1x M20 for cable Ø 6…13 mm
Ambient conditions:	
Ambient temperature:	−25 °C … +65 °C
Climatic resistance:	to DIN EN 60068, Part 2 - 30
Overvoltage category:	III
Degree of pollution:	3
Contact elements:	
Contact material:	AgNi 10, gold-plated
Control elements - protection class:	IP 65
Rated operating voltage U_r:	max. 24 V
Utilisation category:	AC-15/DC-13
Rated operating current/voltage I_e/U_e:	AC-15: 2 A / 24 VAC DC-13: 1 A / 24 VDC
Thermal test current I_{the}:	2.5 A
Fuse rating:	2.5 A slow-blow
Contact system:	cross-point system
Contact force:	0.5 N per contact point = 1 N per contact
Switching of low voltages:	min. 5 V / 1 mA
Switching frequency:	1,200 s/h
Rated insulation voltage U_i:	60 V
Bounce time:	< 2 ms at 100 mm/s operating speed
Mech. lifetime:	1 million operations
Switch travel:	approx. 3 mm
Resistance to shocks:	100 g / 6 ms
Resistance to vibrations:	20 g, 10 … 200 Hz
Wiring labels:	to DIN EN 50005 or DIN EN 50013
Actuating force at end of travel (1NC/1NO):	8 N

Technical data

Illuminated pushbuttons:	
Enclosure material:	glass-fibre reinforced thermoplastic, self-extinguishing
Illuminated pushbutton material:	all-insulated
Front collar material:	plastic
Calotte material:	plastic
Illuminated pushbutton - protection class:	IP 65
Rated operating voltage U_r:	max. 24 V
Fuse rating:	2.5 A slow-blow
Rated insulation voltage U_i:	60 V
Wiring labels:	to DIN EN 50005 or DIN EN 50013: X1/X2
Lamp values illuminated pushbutton:	
Lamp fitting:	Ba5S
LED replacement:	from front
Safety classification emergency stop command device:	
Standards:	EN ISO 13849-1
B_{10d}:	100,000
Mission time:	20 years

$$MTTF_d = \frac{B_{10d}}{0{,}1 \times n_{op}} \qquad n_{op} = \frac{d_{op} \times h_{op} \times 3600\ s/h}{t_{cycle}}$$

Ordering details

BDF 200-①-②-③-④-⑤

No.	Option	Description
①	NH	Emergency stop latching pushbutton without protective collar
	NHK	with protective collar
	…	Operating element pos. 1
②	20 *	2 NO contacts
	11 *	1 NO / 1 NC contact
③	…	Operating element pos. 2
④	…	Operating element pos. 3
⑤	…	Operating element pos. 4

Unused positions are labelled „B“ and are sealed with a blanking plug in factory.

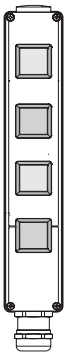
Note

* Contact variant -20 or -11 continuous for all positions (exception: emergency stop with 1 NO / 2 NC contacts)
Contact variants -20 or -11 cannot be combined to each other

Example:
BDF 200-NH-20-DTYE-B-LMGN

The description of the suitable control elements can be found as of page **42**.

Note



Control panel

Pos. 1

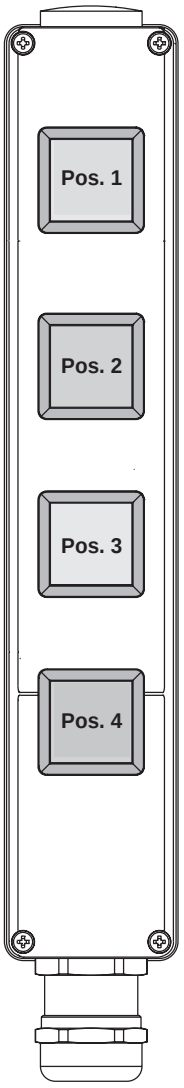
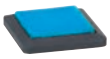
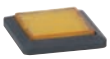
Pos. 2

Pos. 3

Pos. 4

Possible equipment of the positions 1 to 4, refer to table page **41**.

Innovations 2010/2011 - Control panel BDF 200

Control elements		Pos. 1	Pos. 2	Pos. 3	Pos. 4	Control panel
	NH	●				
	NHK	●				
	PT..	●	●	●	●	
	DT..	●	●	●	●	
	LT..	●	●	●	●	
	LM..	●	●	●	●	
	SWS20 SWT20		●	●		
	WS20 WS30 WT20 WT30 WTS30		●	●		
	WS21 WS31 WT21 WT31 WTS31		●	●		

Description of the control elements, as of page **42**.

Note

The colour of the upper enclosure cap basically is yellow when the emergency stop command devices NH and NHK are used.
If there is no control element in position 1, the control panel is supplied with a black enclosure cap.

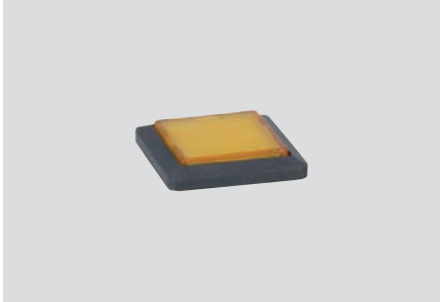
NH / NHK

- **Emergency stop latching pushbutton**
- Mushroom-shaped plastic pushbutton, Ø 30 mm
- Pull to reset
- 1 NO contact / 2 NC contacts
- Without protective collar: ordering suffix **NH**
- With protective collar: ordering suffix **NHK**

DT..

- **Pushbutton**
- With concave button
- Contact surface 19 x 19 mm
- 2 NO contacts or 1 NO/1 NC contact
- Available in 6 different colours
- Prints on device on request
- Ordering suffix, refer to table below

LM..

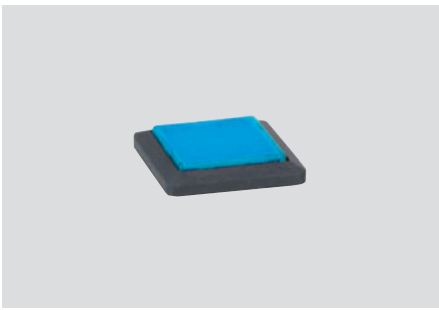


- **Signalling device**
- Illuminated surface 19 x 19 mm
- Lamp replacement from front
- Available in 5 different colours
- Prints on device on request
- Ordering suffix, refer to table below

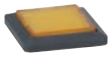
PT..

- **Mushroom-shaped pushbutton**
- Contact surface 25 x 25 mm with rounded sides
- Not latching
- 2 NO contacts or 1 NO/1 NC contact
- Available in 6 different colours
- Prints on device on request
- Ordering suffix, refer to table below

LT..



- **Illuminated pushbutton**
- With concave button
- Contact surface 19 x 19 mm
- 2 NO contacts or 1 NO/1 NC contact
- Lamp replacement from front
- Available in 5 different colours
- Prints on device on request
- Ordering suffix, refer to table below

Suffix	yellow	red	green	blue	black	white
Mushroom-shaped pushbutton PT..	PT**YE**	PT**RD**	PT**GN**	PT**BU**	PT**BK**	PT**WH**
Pushbutton DT..	DT**YE**	DT**RD**	DT**GN**	DT**BU**	DT**BK**	DT**WH**
Illuminated pushbutton LT..	LT**YE**	LT**RD**	LT**GN**	LT**BU**		LT**WH**
 **Signalling device LM..**	LM**YE**	LM**RD**	LM**GN**	LM**BU**		LM**WH**

Innovations 2010/2011 - Control panel BDF 200

W..0

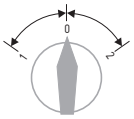
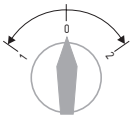
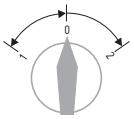
- **Selector switch / Spring-return selector switch**
- Version with standard knob, anthracite grey
- Ordering suffix, refer to table below

W..1

- **Selector switch / Spring-return selector switch**
- Version with long knob, anthracite grey
- Ordering suffix, refer to table below

SW.20

- **Key-operated selector switch / Spring-return selector switch**
- Version with high-grade cylinder lock, therefore IP 65 as well
- Ordering suffix, refer to table below

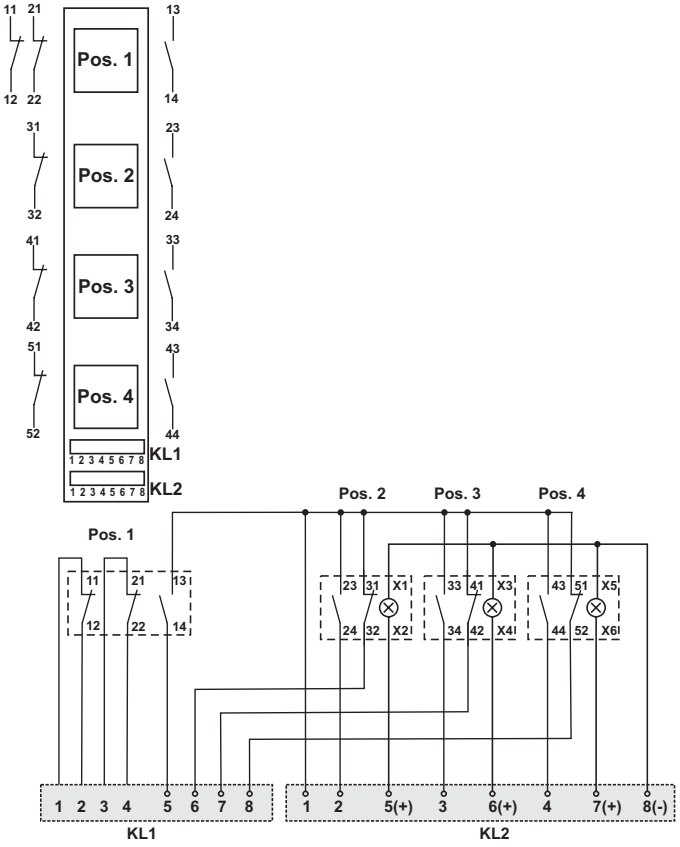
Ordering suffix	Selector switch	Selector switch	Spring-return	Spring-return	Selector switch
					
	1 latching position	2 latching positions left and right of the zero position	1 touch position and automatic return to the zero position	2 touch positions left and right of the zero position and automatic return to the zero position	1 touch position right and automatic return to the zero position + 1 latching position left of the zero position
	2 NO contacts or 1 NO/1 NC contact	1 NO contact for each switching position or 1 NC contact (position 1) and 1 NO contact (position 2)	2 NO contacts or 1 NO/1 NC contact	1 NO contact for each switching position or 1 NC contact (position 1) and 1 NO contact (position 2)	1 NO contact for each switching position or 1 NC contact (position 1) and 1 NO contact (position 2)
Standard knob	**WS20**	**WS30**	**WT20**	**WT30**	**WTS30**
Long knob	**WS21**	**WS31**	**WT21**	**WT31**	**WTS31**
Key-operated switch	**SWS20**		**SWT20**		

BDF 200-NH-11-…

1 NO / 2 NC contacts
for emergency stop at Pos. 1

1 NO / 1 NC contact
for operating elements at Pos. 2 - 4

Terminal configuration

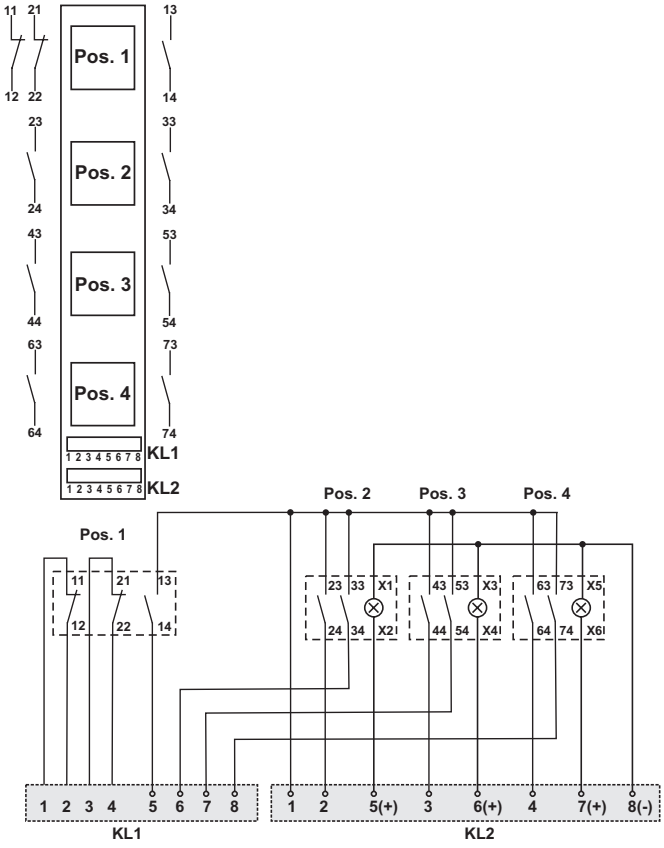


BDF 200-NH-20-…

1 NO / 2 NC contacts
for emergency stop at Pos. 1

2 NO contacts
for operating elements at Pos. 2 - 4

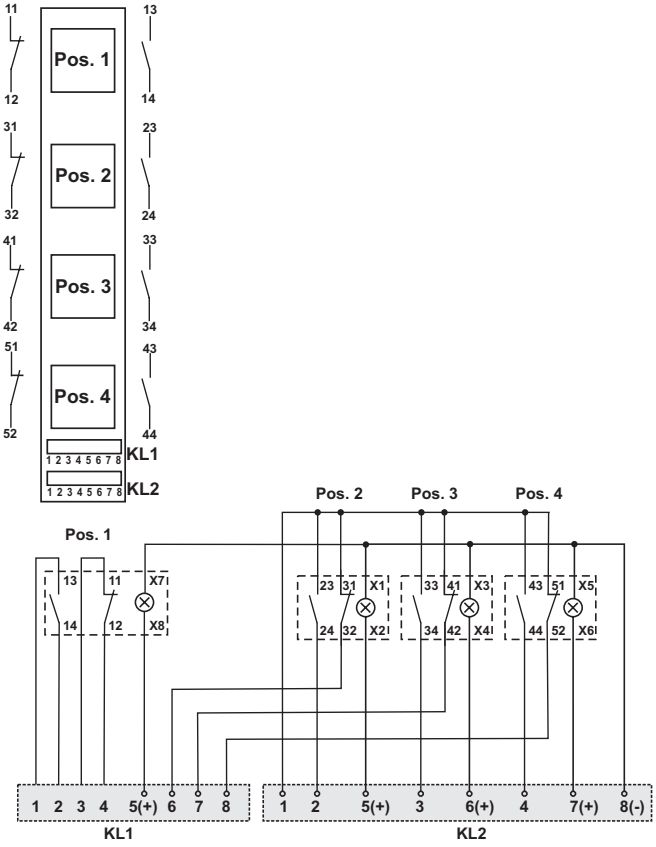
Terminal configuration



BDF 200-..-11-...

1 NO / 1 NC contact
for operating elements at Pos. 1 - 4

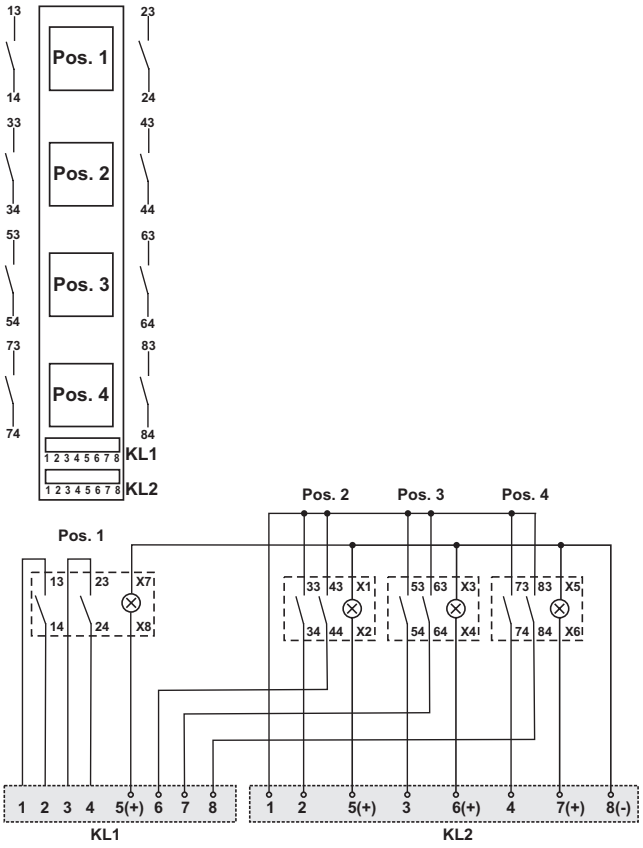
Terminal configuration



BDF 200-..-20-...

2 NO contacts
for operating elements at Pos. 1 - 4

Terminal configuration



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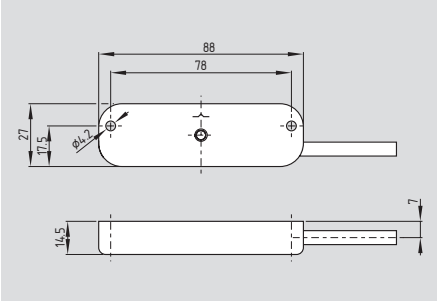
Magnetic safety sensor

■ BNS 40S_____Page 48

The essential difference between electromechanical safety switches and magnetic safety sensors is the non-contact operating principle of the latter. Due to this operating principle, sensors and actuators with fully smooth surfaces without dead spaces can be designed and the sensor furthermore is not subject to wear.
These features are not only advantageous on food-processing machinery. The switching components furthermore are very compact and can be optimally integrated in the surrounding construction – if necessary they can even be fitted in concealed mounting when the safety guard or the cover is in non-ferromagnetic materials such as plastic or stainless steel.

The latest innovation in this field is the BNS 40S safety sensor in stainless steel enclosure, which was developed especially for hygiene-critical environments. The design and the material choice of these switching components meet the requirements of the “Hygienic Design”. They are resistant to cleaning agents and chemicals; as a result of their protection class IP 69K, they can also be used in plants, which are cleaned by means of steam jet cleaners.
No dead spaces, thorough and thoughtful sealing, corrosion-resistant and ECOLAB certified materials, food-safe connecting cables: these are typical additional specification for switching components, which are used in food-processing industry.

BNS 40S



- Fully encapsulated stainless steel enclosure
- Coded
- Rectangular design
- Long life, no mechanical wear
- Protection class IP69K
- Actuation only possible with BPS 40S-…
- Insensitive to lateral misalignment
- Concealed mounting possible
- Insensitive to soiling
- Suitable for food-processing industry
- Food-safe connecting cable

Approvals

all under preparation

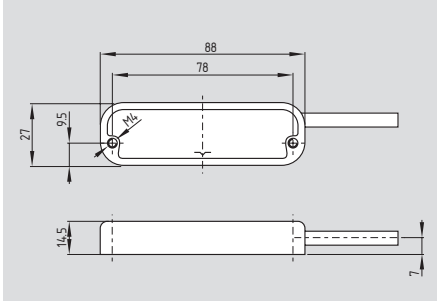
Ordering details

BNS 40S-12Z①

No.	Option	Description
①		without LED
	G	with LED

The actuating magnet must be ordered separately.

BNS 40S-…-C



- Concealed threaded holes on the rear-side provide for smooth cleaning

Approvals

all under preparation

Ordering details

BNS 40S-12Z①-C

No.	Option	Description
①		without LED
	G	with LED

The actuating magnet must be ordered separately.

Technical data

Standards:	IEC 60947-5-3, BG-GS-ET-14
Design:	rectangular
Enclosure:	Stainless steel V4A (Material designation to DIN 1.3960)
Protection class:	IP69K to IEC/EN 60529
Connection:	cable LiYY, 1 m (suitable for the food industry)
Cable section:	6 x 0.25 mm²
Mode of operation:	magnetic
Actuating magnet:	BPS 40S-1, BPS 40S-2, BPS 40S-1-C, BPS 40S-2-C, coded
S_{ao}:	8 mm
S_{ar}:	18 mm
Switching conditions indicator:	LED only for ordering suffix G
Max. switching voltage	
- without LED:	max. 100 VAC/DC
- with LED:	max. 24 VDC
Max. switching current	
- without LED:	max. 250 mA
- with LED:	max. 10 mA
Max. switching capacity	
without LED:	max. 3 W
with LED:	max. 240 mW
Ambient temperature:	−25 °C … +80 °C
Storage and transport temperature:	−25 °C … +80 °C
Max. switching frequency:	max. 5 Hz
Resistance to shock:	30 g / 11 ms
Resistance to vibration:	10 … 55 Hz, amplitude 1 mm

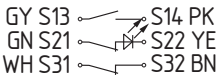
Classification:

Standards:	EN ISO 13849-1
B_{10d} (NC/NO):	25,000,000 for 20% contact load
Mission time:	20 years

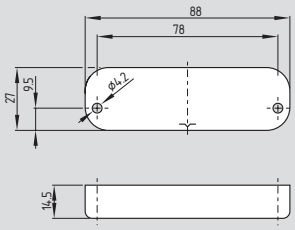
$$MTTF_d = \frac{B_{10d}}{0{,}1 \times n_{op}} \qquad n_{op} = \frac{d_{op} \times h_{op} \times 3600\ s/h}{t_{cycle}}$$

Contact variants

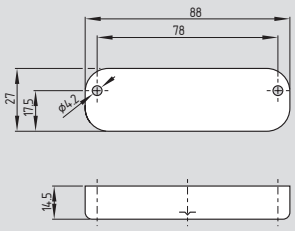
1 NO / 2 NC



System components

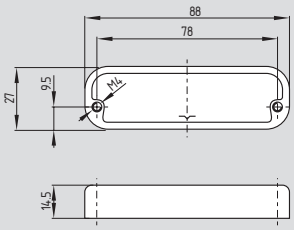


BPS 40S-1

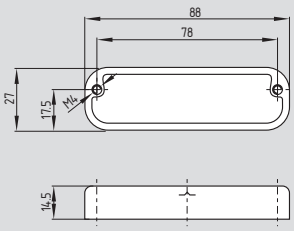


BPS 40S-2

System components



BPS 40S-1-C



BPS 40S-2-C

Note

Contact symbols shown for the closed condition of the guard device.

The contact configuration for versions with or without LED is identical.

Contacts S21-S22 must be integrated in the safety circuit.

The LED is illuminated when the guard door is closed.

Ordering details

Fully encapsulated stainless steel enclosure:

Actuator and sensor mounted on same fixing plane	**BPS 40S-1**
Actuator for 90° fixing	**BPS 40S-2**

Ordering details

Fully encapsulated stainless steel enclosure:

Actuator and sensor mounted on same fixing plane, rear-side threaded holes	**BPS 40S-1-C**
Actuator for 90° fixing, rear-side threaded holes	**BPS 40S-2-C**

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- BDF 200 AS _____ Page 52
- Z/T 235 AS _____ Page 56
- Z/T 236 AS _____ Page 56
- Z/T 256 AS _____ Page 56
- T 335 AS _____ Page 64
- T 336 AS _____ Page 64
- AZM 170 AS _____ Page 68

AS-Interface Innovations / Product extensions

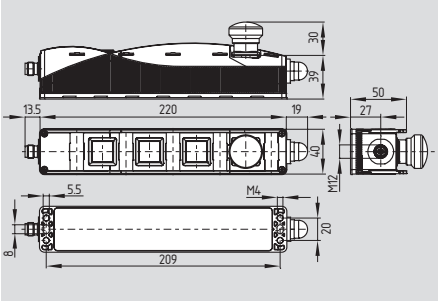
K.A. Schmersal GmbH is one of the leading providers of safety switching components with integrated AS-i Safety at Work interface. On the occasion of SPS 2010, the product range was extended once more.

The BDF 200 AS modular operating panel is the compact and user-specific configurable operating panel for use at the safety guard from the Schmersal Group with integrated AS-i Safety at Work interface. With the BDF 200 AS operating panel, the machine builder can activate the necessary emergency stop, on/off and reset functions at the safety guard.

As a result of the development of new, compact electronics for AS-i Safety at Work, all standard models of the position switches, 235, 236, 256 and 335, 336 now are also available with integrated AS-i Safety at Work electronics. These position switches can be supplied either with an M12 connector or with an AS-i flat cable terminal for direct connection to the yellow AS-i cable.

The AZM 170 AS is the smallest solenoid interlock with integrated AS-i Safety at Work interface from Schmersal. This component is available in a version with safe actuator monitoring and a version with combined actuator and interlock monitoring.

BDF 200 AS



- Control panel with emergency stop function
- Slim, shock-resistant plastic enclosure
- Can be fitted onto customary aluminium profile systems
- Comprehensive selection of illuminated pushbuttons, selector switches, signalling devices with LED, key-operated switches and emergency stop switches/pushbuttons
- Emergency stop, start/stop and reset functions available
- Two-layer plastic identification labels can be used (engravements on request)
- Integrated AS-Interface interface Safety Slave for emergency stop and A/B Slave for command and signalling devices
- AS-Interface M12 connector optionally at the bottom or on top
- Suitable for AS-i Power24
- Protection class IP65

Approvals

TÜV * cULus ASi * under preparation CE

Technical data

Standards:	EN 60947-5-1, EN ISO 13850, EN ISO 13849-1, IEC 61508, EN 50295
Enclosure:	
Enclosure material:	glass-fibre reinforced thermoplastic, self-extinguishing
Mechanical life:	
- Emergency stop:	100.000 operations
- Command device:	1 million operations
Response time - Emergency stop:	< 100 ms
Design of electrical connection:	Connector M12
Lamp values illuminated pushbutton:	
Lamp fitting:	Ba5S, only LED, length 17 mm
LED replacement:	from front
Electrical data - AS interface	
AS-i Supply voltage:	18,0 … 31,6 VDC, protection against polarity reversal
AS-i operating current:	≤ 150 mA
AS-i Device insulation:	internally short-circuit proof
AS-i specification	**Safety-Slave**
- Version:	V 3.0
- Profile:	S-7.B.F.F
AS-i Inputs	
- Channel 1:	Data bits DI 0/DI 1= dynamic code transmission
- Channel 2:	Data bits DI 2/DI 3= dynamic code transmission
AS-i Outputs	
- DO 0:	Indicator lamp G24 red
- DO 1:	Indicator lamp G24 green
- DO 2 … DO 3:	not used
AS-i Parameter bits	
- P0 … P3:	not used
AS-i specification	**A/B-Slave**
- Version:	V 3.0
- Profile:	S-7.A.7.F
AS-i Inputs	
- DI 0:	Control element on position 4
- DI 1:	Control element on position 3
- DI 2:	Control element on position 2
- DI 3:	Control element on position 2

Technical data

AS-i Outputs	
- DO 0:	Signalling element on position 4
- DO 1:	Signalling element on position 3
- DO 2:	Signalling element on position 2
- DO 3:	not used
AS-i Parameter bits	
- P0 … P3:	not used
AS-i input module address:	0
- Default on address 0, programmable via the AS-Interface Master or Hand-held programming device	
Ambient conditions:	
Ambient temperature:	−25 °C … +50 °C
Storage and transport temperature:	−25 °C … +85 °C
Climatic resistance:	to DIN EN 60068, Part 2 - 30
Protection class-Enclosure:	IP65
Protection rating:	II ⧈
Resistance to vibration:	10 … 150 Hz, amplitude 0,35 mm / 5 g
Resistance to shock:	30 g / 11 ms
Classification - Emergency stop function:	
Standards:	EN ISO 13849-1; IEC 61508
PL:	up to e
Category:	up to 4
PFH value:	1,4 x 10^{-8}/h
- Notice:	up to max. 5.000 switching cycles/year
SIL:	up to 3
Mission time:	20 years

Ordering details

BDF 200-①-AS-②-③-④-⑤-⑥

No.	Option	Description
①	ST1	Connector M12, bottom
	ST2	Connector M12, top (not for G24)
②	**Pos. 1**	**Command devices**
	NH	Emergency stop latching push-button without protective collar
	NHK	with protective collar
③	**Pos. 2**	**Command and signalling**
	WS 2/3	Maintained selector switch, 2/3 positions
	WT. 2/3	Spring-return selector switch, 2/3 positions
	SW. 20	Key selector switch, 2 positions
	LT..	Illuminated pushbutton
	LM..	Signalling device
	DT..	Pushbutton

Ordering details

No.	Option	Description
④	**Pos. 3**	**Command and signalling devices**
	LT..	Illuminated pushbutton
	LM..	Signalling device
	DT..	Pushbutton
⑤	**Pos. 3**	**Command and signalling devices**
	LT..	Illuminated pushbutton
	LM..	Signalling device
	DT..	Pushbutton
⑥		Without indicator lamp G24
	G24	With indicator lamp G24, top

Unused positions are labelled „B“ and are

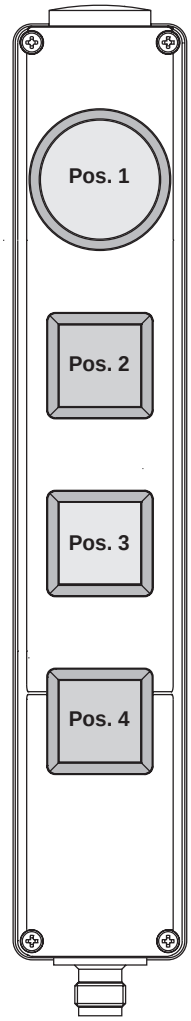
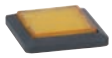
Note

Pin configuration
M12 connector

4-pole

PIN 1: AS-i +
PIN 2: spare
PIN 3: AS-i −
PIN 4: spare

The addressing must take place via the M12 connector.
Both AS-i slaves can be enabled and disabled through the integrated DIP switch.

Control elements		Pos. 1	Pos. 2	Pos. 3	Pos. 4	Control panel
	NH	●				
	NHK	●				
	LT..		●	●	●	
	LM..		●	●	●	
	DT..		●	●	●	
	SWS20 SWT20		●			
	WS20 WS30 WT20 WT30 WTS30		●			

Description of the control elements, as of page **54**.

Note

Recommended types:

BDF 200 ST1-AS NHK-LMRD-LTWH-LTBU
BDF 200 ST1-AS NHK-LMRD-LTWH-LTGN

- Emergency stop latching pushbutton with protective collar
- Signalling device red for “emergency stop actuated”
- Illuminated pushbutton white for automatic stop
- Illuminated pushbutton blue/green for reset/start

Note

Recommended types:

BDF 200 ST1-AS NHK-LTWH-LTBU-LTWH
BDF 200 ST1-AS NHK-LTWH-LTGN-LTWH

- Emergency stop latching pushbutton with protective collar
- Illuminated pushbutton white for automatic stop
- Illuminated pushbutton blue/green for reset/start
- Illuminated pushbutton white for miscellaneous functions

Note

Recommended types:

BDF 200 ST1-AS NHK-SWS20-LTWH-LTBU-G24
BDF 200 ST1-AS NHK-SWS20-LTWH-LTGN-G24

- Emergency stop latching pushbutton with protective collar
- Key selector switch for authorisation to operate
- Illuminated pushbutton white for automatic stop
- Illuminated pushbutton blue/green for reset/start
- Indicator lamp G24 for “emergency stop actuated”

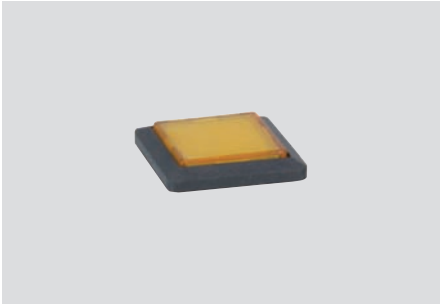
NH / NHK

- **Emergency stop latching pushbutton**
- Mushroom-shaped plastic pushbutton, Ø 30 mm
- Pull to reset
- 2 NC contacts on Safety Slave
- Without protective collar: ordering suffix **NH**
- With protective collar: ordering suffix **NHK**

LT..

- **Illuminated pushbutton**
- With concave button
- Contact surface 19 x 19 mm
- 1 NO contact on DI A/B Slave
- 1 LED on DO A/B Slave
- Lamp replacement from front
- Available in 5 different colours
- Prints on device on request
- Ordering suffix, refer to table below

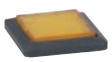
LM..



- **Signalling device**
- With concave button
- Illuminated surface 19 x 19 mm
- 1 NO contact on DO A/B Slave
- Lamp replacement from front
- Available in 5 different colours
- Prints on device on request
- Ordering suffix, refer to table below

DT..

- **Pushbutton**
- With concave button
- Contact surface 19 x 19 mm
- 1 NO contact on DI A/B Slave
- Available in 6 different colours
- Prints on device on request
- Ordering suffix, refer to table below

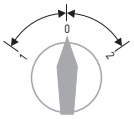
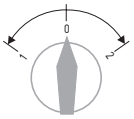
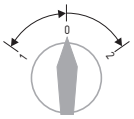
Suffix	yellow	red	green	blue	black	white
Illuminated pushbutton LT..	LT**YE**	LT**RD**	LT**GN**	LT**BU**		LT**WH**
 **Signalling device LM..**	LM**YE**	LM**RD**	LM**GN**	LM**BU**		LM**WH**
Pushbutton DT..	DT**YE**	DT**RD**	DT**GN**	DT**BU**	DT**BK**	DT**WH**

W..0

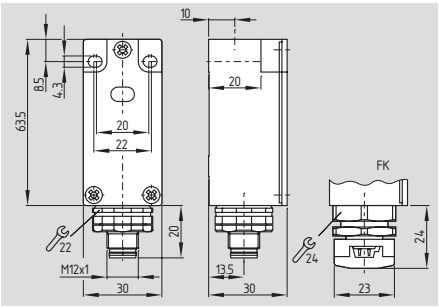
- **Selector switch / Spring-return selector switch**
- Version with standard knob, anthracite grey
- Ordering suffix, refer to table below

SW.20

- **Key-operated selector switch / Spring-return selector switch**
- Version with high-grade cylinder lock, therefore IP 65 as well
- Ordering suffix, refer to table below

Ordering suffix	Selector switch	Selector switch	Spring-return	Spring-return	Selector switch
					
	1 latching position	2 latching positions left and right of the zero position	1 touch position and automatic return to the zero position	2 touch positions left and right of the zero position and automatic return to the zero position	1 touch position right and automatic return to the zero position + 1 latching position left of the zero position
	1 NO contact	1 NO contact for each switching position	1 NO contact	1 NO contact for each switching position	1 NO contact for each switching position
Standard knob	**WS20**	**WS30**	**WT20**	**WT30**	**WTS30**
Key-operated switch	**SWS20**		**SWT20**		

Z/T 235 AS



Position switches with safety functions
- Mounting details to DIN EN 50047
- Metal enclosure
- Integrated AS-Interface interface
- AS-Interface LED and status display
- AS-Interface M12 connector (turnable) or flat cable connection (turnable)
- Suitable for AS-i Power24
- Wide range of alternative actuators
- Actuator heads can be repositioned by 4 x 90°
- Angle of roller lever adjustable in 10° steps
- Good resistance to oil and petroleum spirit
- Protection class IP67

Approvals

* under preparation

Technical data

Standards:	EN 50295, EN 60947-5-1, EN ISO 13849-1, IEC 61508
Design:	fixings to DIN EN 50047
Material of the housings:	zinc die-cast, enamel finish
Switching system:	slow or snap action, NC contacts with positive break ⊖
Max. Actuating speed:	1 m/s
Response time:	< 100 ms

Mechanical data

Design of electrical connection:	Connector M12, 5-pole, or flat cable connection
Switching frequency:	max. 5000/h
Mechanical life:	> 1.000.000 operations

Ambient conditions

Ambient temperature:	−25 °C … +60 °C
Storage and transport temperature:	−25 °C … +85 °C
Relative humidity:	30 %… 95 %
- non-condensing	
- non-icing	
Protection class:	IP67 to IEC/EN 60529
Protection rating:	II
Resistance to vibration:	10 … 150 Hz, amplitude 0,35 mm / 5g
Resistance to shock:	30 g / 11 ms

Electrical data - AS interface

AS-i Supply voltage:	18,0 … 31,6 VDC, protection against polarity reversal
AS-i operating current:	≤ 50 mA
AS-i Device insulation::	internally short-circuit proof
AS-i Specification	
- Version:	V 3.0
- Profile:	S-0.B.F.F
AS-i Inputs	
- Channel 1:	Data bits DI 0/DI 1= dynamic code transmission
- Channel 2:	Data bits DI 2/DI 3= dynamic code transmission
AS-i Outputs	
- DO 0 … DO 3:	not used
AS-i Parameter bits	
- P0:	Channel 2 switched
- P1 … P3:	not used

Technical data

AS-i input module address:	0
- Default on address 0, programmable via the AS-Interface Master or Hand-held programming device	

AS-i LED switching conditions display

(1) yellow LED:	Channel 1 / AS-i SaW bit 0,1
(2) green/red LED (AS-i duo LED):	Supply voltage / Communication error / Slave address = 0
(3) yellow LED:	Channel 2 / AS-i SaW bit 2,3

Classification

If a fault exclusion for hazardous damage of the 1-channel mechanics is authorized and an adequate protection against tampering is ensured, suitable for use up to:

Standards:	EN ISO 13849-1, IEC 61508
PL:	up to d
Category:	up to 3
PFH value:	1,01 x 10^{-7}/h
- Notice:	up to max. 100.000 switching cycles/year
SIL:	up to 2
Mission time:	20 years

Basically suitable up to

Standards:	EN ISO 13849-1, IEC 61508
PL:	up to c
Category:	up to 1
PFH value:	1,14 x 10^{-6}/h
- Notice:	up to max. 100.000 switching cycles/year
SIL:	up to 1
Mission time:	20 years

Ordering details

①② **235** ③**-AS**

No.	Option	Description
①	Z	Snap action ⊖
	T	Slow action ⊖
②	For the appropriate actuator: see as of page **5-59**	
③	ST	Connector M12, metal
	FK	Flat cable connection

Note

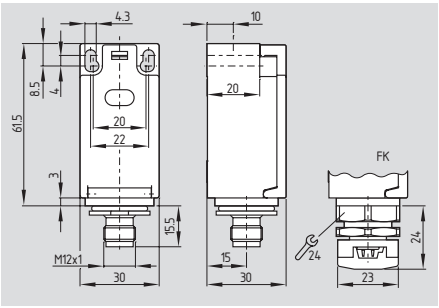
Pin configuration
M12 connector
5-pole

PIN 1: AS-i +
PIN 2: spare
PIN 3: AS-i −
PIN 4: spare
PIN 5: FE (Functional earth connection)

Note

Addressing through the M12 connector or the flat cable connection

Z/T 236 AS



Position switches with safety functions
- Mounting details to DIN EN 50047
- Thermoplastic enclosure
- Integrated AS-Interface interface
- AS-Interface LED and status display
- AS-Interface M12 connector, or flat cable connection (turnable)
- Suitable for AS-i Power24
- Wide range of alternative actuators
- Actuator heads can be repositioned by 4 x 90°
- Angle of roller lever adjustable in 10° steps
- Good resistance to oil and petroleum spirit
- Protection class IP67

Approvals

* under preparation

Technical data

Standards:	EN 50295, EN 60947-5-1, EN ISO 13849-1, IEC 61508
Design:	fixings to DIN EN 50047
Material of the housings:	plastic, glass-fibre reinforced thermoplastic, self-extinguishing
Switching system:	slow or snap action, NC contacts with positive break ⊖
Max. Actuating speed:	1 m/s
Response time:	< 100 ms

Mechanical data

Design of electrical connection:	Connector M12, 4-pole, or flat cable connection
Switching frequency:	max. 5000/h
Mechanical life:	> 1.000.000 operations

Ambient conditions

Ambient temperature:	−25 °C … +60 °C
Storage and transport temperature:	−25 °C … +85 °C
Relative humidity:	30 %… 95 %
- non-condensing	
- non-icing	
Protection class:	IP67 to IEC/EN 60529
Protection rating:	II, ⧈
Resistance to vibration:	10 … 150 Hz, amplitude 0,35 mm / 5g
Resistance to shock:	30 g / 11 ms

Electrical data - AS interface

AS-i Supply voltage:	18,0 … 31,6 VDC, protection against polarity reversal
AS-i operating current:	≤ 50 mA
AS-i Device insulation::	internally short-circuit proof
AS-i Specification	
- Version:	V 3.0
- Profile:	S-0.B.F.F
AS-i Inputs	
- Channel 1:	Data bits DI 0/DI 1= dynamic code transmission
- Channel 2:	Data bits DI 2/DI 3= dynamic code transmission
AS-i Outputs	
- DO 0 … DO 3:	not used
AS-i Parameter bits	
- P0:	Channel 2 switched
- P1 … P3:	not used

Technical data

AS-i input module address:	0
- Default on address 0, programmable via the AS-Interface Master or Hand-held programming device	

AS-i LED switching conditions display

(1) yellow LED:	Channel 1 / AS-i SaW bit 0,1
(2) green/red LED (AS-i duo LED):	Supply voltage / Communication error / Slave address = 0 / periphery error
(3) yellow LED:	Channel 2 / AS-i SaW bit 2,3

Classification

If a fault exclusion for hazardous damage of the 1-channel mechanics is authorized and an adequate protection against tampering is ensured, suitable for use up to:

Standards:	EN ISO 13849-1, IEC 61508
PL:	up to d
Category:	up to 3
PFH value:	1,01 x 10^{-7}/h
- Notice:	up to max. 100.000 switching cycles/year
SIL:	up to 2
Mission time:	20 years

Basically suitable up to

Standards:	EN ISO 13849-1, IEC 61508
PL:	up to c
Category:	up to 1
PFH value:	1,14 x 10^{-6}/h
- Notice:	up to max. 100.000 switching cycles/year
SIL:	up to 1
Mission time:	20 years

Ordering details

①② **236** ③**-AS**

No.	Option	Description
①	Z	Snap action ⊖
	T	Slow action ⊖
②	For the appropriate actuator: see as of page **5-59**	
③	ST	Connector M12, plastic
	FK	Flat cable connection

Note

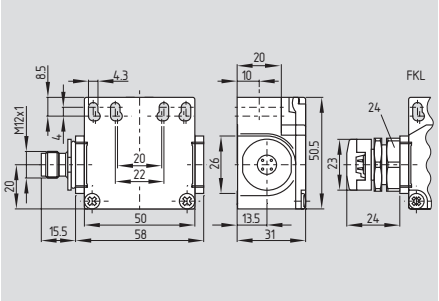
Pin configuration
M12 connector
4-pole

PIN 1: AS-i +
PIN 2: spare
PIN 3: AS-i −
PIN 4: spare

Note

Addressing through the M12 connector or the flat cable connection

Z/T 256 AS



Position switches with safety functions
- Mounting details to DIN EN 50047
- Thermoplastic enclosure
- Integrated AS-Interface interface
- AS-Interface LED and status display
- AS-Interface M12 connector, or flat cable connection (turnable)
- Suitable for AS-i Power24
- Wide range of alternative actuators
- Actuator heads can be repositioned by 4 x 90°
- Angle of roller lever adjustable in 10° steps
- Good resistance to oil and petroleum spirit
- Protection class IP67

Approvals

* under preparation

Technical data

Standards:	EN 50295, EN 60947-5-1, EN ISO 13849-1, IEC 61508
Design:	fixings to DIN EN 50047
Material of the housings:	plastic, glass-fibre reinforced thermoplastic, self-extinguishing
Switching system:	slow or snap action, NC contacts with positive break ⊖
Max. Actuating speed:	1 m/s
Response time:	< 100 ms

Mechanical data

Design of electrical connection:	Connector M12, 4-pole, or flat cable connection
Switching frequency:	max. 5000/h
Mechanical life:	> 1.000.000 operations

Ambient conditions

Ambient temperature:	−25 °C … +60 °C
Storage and transport temperature:	−25 °C … +85 °C
Relative humidity:	30 %… 95 %
- non-condensing	
- non-icing	
Protection class:	IP67 to IEC/EN 60529
Protection rating:	II, ⧈
Resistance to vibration:	10 … 150 Hz, amplitude 0,35 mm / 5g
Resistance to shock:	30 g / 11 ms

Electrical data - AS interface

AS-i Supply voltage:	18,0 … 31,6 VDC, protection against polarity reversal
AS-i operating current:	≤ 50 mA
AS-i Device insulation::	internally short-circuit proof
AS-i Specification	
- Version:	V 3.0
- Profile:	S-0.B.F.F
AS-i Inputs	
- Channel 1:	Data bits DI 0/DI 1= dynamic code transmission
- Channel 2:	Data bits DI 2/DI 3= dynamic code transmission
AS-i Outputs	
- DO 0 … DO 3:	not used
AS-i Parameter bits	
- P0:	Channel 2 switched
- P1 … P3:	not used

Technical data

AS-i input module address:	0
- Default on address 0, programmable via the AS-Interface Master or Hand-held programming device	

AS-i LED switching conditions display

(1) yellow LED:	Channel 1 / AS-i SaW bit 0,1
(2) green/red LED (AS-i duo LED):	Supply voltage / Communication error / Slave address = 0 / periphery error
(3) yellow LED:	Channel 2 / AS-i SaW bit 2,3

Classification

If a fault exclusion for hazardous damage of the 1-channel mechanics is authorized and an adequate protection against tampering is ensured, suitable for use up to:

Standards:	EN ISO 13849-1, IEC 61508
PL:	up to d
Category:	up to 3
PFH value:	1,01 x 10^{-7}/h
- Notice:	up to max. 100.000 switching cycles/year
SIL:	up to 2
Mission time:	20 years

Basically suitable up to

Standards:	EN ISO 13849-1, IEC 61508
PL:	up to c
Category:	up to 1
PFH value:	1,14 x 10^{-6}/h
- Notice:	up to max. 100.000 switching cycles/year
SIL:	up to 1
Mission time:	20 years

Ordering details

①② **256** ③**-AS**

No.	Option	Description
①	Z	Snap action ⊖
	T	Slow action ⊖
②	For the appropriate actuator: see as of page **5-59**	
③	STR	Connector M12, right
	STL	Connector M12, left
	FKR	Flat cable connection, right
	FKL	Flat cable connection, left

Note

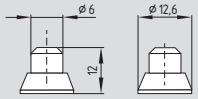
Pin configuration
M12 connector

4-pole	PIN 1: AS-i +
	PIN 2: spare
	PIN 3: AS-i −
	PIN 4: spare

Note

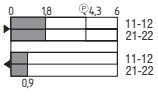
Addressing through the M12 connector or the flat cable connection

Plunger S

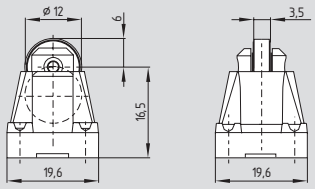


- Actuator type B to EN 50047
- Actuating force: Min. 9 N
- Positive break force: 19 N
- Actuating speed with actuating angle 0° to switch axis max. 1 m/s

Contact variants

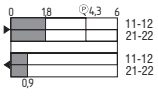
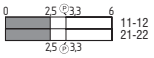
Contacts/ Switch travel	Snap action	Slow action
2 NC	**ZS 2..-02-AS** 	**TS 2..-02-AS**

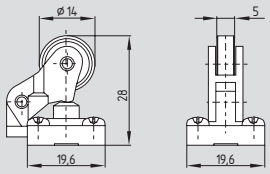
Roller plunger R



- Actuator type C to EN 50047
- Actuating force: Min. 9 N
- Positive break force: 19 N
- Actuating speed with actuating angle 30° to switch axis max. 1 m/s

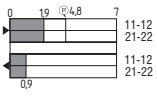
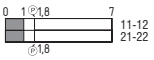
Contact variants

Contacts/ Switch travel	Snap action	Slow action
2 NC	**ZR 2..-02-AS** 	**TR 2..-02-AS**

Offset roller lever 1R

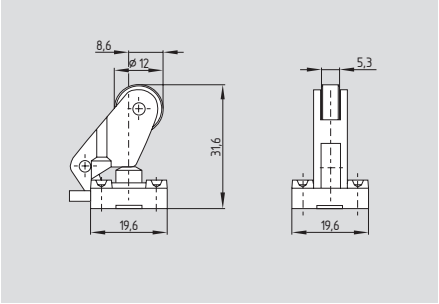


- Actuating force: Min. 9 N
- Positive break force: 19 N
- Actuating speed with actuating angle 30° to switch axis max. 1 m/s

Contact variants

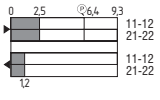
Contacts/ Switch travel	Snap action	Slow action
2 NC	**Z1R 2..-02-AS** 	**T1R 2..-02-AS** 

Angle roller lever K

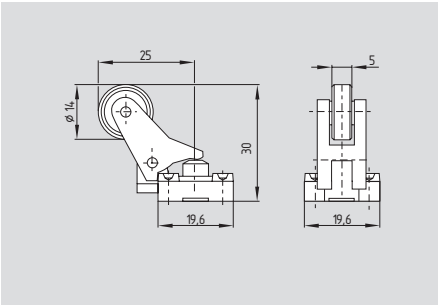


- Actuator type E to EN 50047
- Actuating force: Min. 9 N
- Positive break force: 19 N
- Actuating speed with actuating angle 30° to switch axis max. 1 m/s

Contact variants

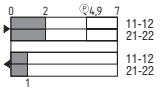
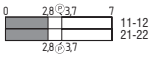
Contacts/ Switch travel	Snap action	Slow action
2 NC	**ZK 2..-02-AS** 	**TK 2..-02-AS**

Angle roller lever 3K

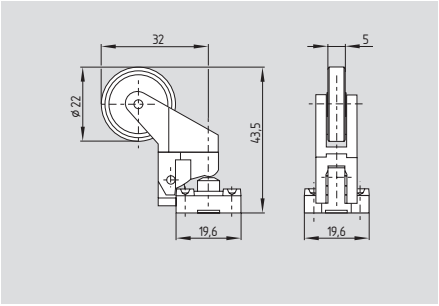


- Actuating force: Min. 9 N
- Positive break force: 19 N
- Actuating speed with actuating angle 30° to switch axis max. 1 m/s
- Actuation from bottom parallel to the switch, therefore only suitable for small housings (Z/T 235 and Z/T 236)

Contact variants

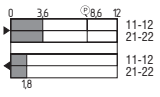
Contacts/ Switch travel	Snap action	Slow action
2 NC	**Z3K 2..-02-AS** 	**T3K 2..-02-AS** 

Angle roller lever 4K

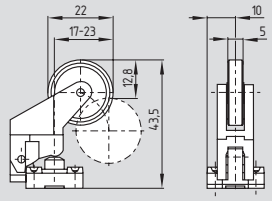


- Actuating force: Min. 6 N
- Positive break force: 16 N
- Actuating speed with actuating angle 30° to switch axis max. 1 m/s
- Actuation from bottom parallel to the switch, therefore only suitable for small housings (Z/T 235 and Z/T 236)

Contact variants

Contacts/ Switch travel	Snap action	Slow action
2 NC	**Z4K 2..-02-AS** 	**T4K 2..-02-AS**

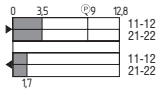
Angle roller lever K4



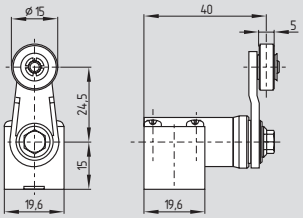
- Actuating force: Min. 6 N
- Positive break force: 16 N
- Actuating speed with actuating angle 30° to switch axis max. 1 m/s

Contact variants

Contacts/ Switch travel	Snap action	Slow action
2 NC	**ZK4 2..-02-AS**	**TK4 2..-02-AS**



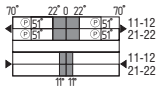
Roller lever V1H

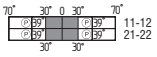


- Plastic lever
- Actuator type A to EN 50047
- Lever angle adjustable in 10° steps
- Actuating torque: Min. 15 Ncm
- Positive break torque: 18.5 Ncm
- Actuating speed with actuating angle 30° to switch axis max. 1 m/s
- Actuator head gasket, ordering suffix -Z

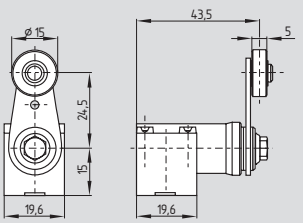
Contact variants

Contacts/ Switch travel	Snap action	Slow action
2 NC	**ZV1H 2..-02-AS**	**TV1H 2..-02-AS**





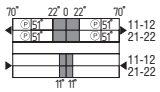
Roller lever V12H

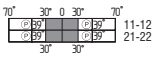


- Metal lever with plastic roller
- Actuator type A to EN 50047
- Lever angle adjustable in 10° steps
- Actuating torque: Min. 15 Ncm
- Positive break torque: 18.5 Ncm
- Actuating speed with actuating angle 30° to switch axis max. 1 m/s
- Actuator head gasket, ordering suffix -Z
- With metal roller, ordering suffix –RMS

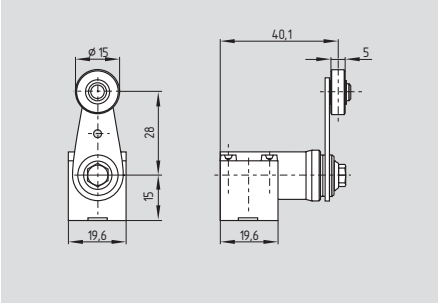
Contact variants

Contacts/ Switch travel	Snap action	Slow action
2 NC	**ZV12H 2..-02-AS**	**TV12H 2..-02-AS**





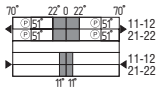
Roller lever V14H

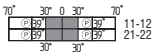


- Metal lever with plastic roller
- Actuator type A to EN 50047
- Lever angle adjustable in 10° steps
- Actuating torque: Min. 15 Ncm
- Positive break torque: 18.5 Ncm
- Actuating speed with actuating angle 30° to switch axis max. 1 m/s
- Actuator head gasket, ordering suffix -Z
- With metal roller, ordering suffix –RMS

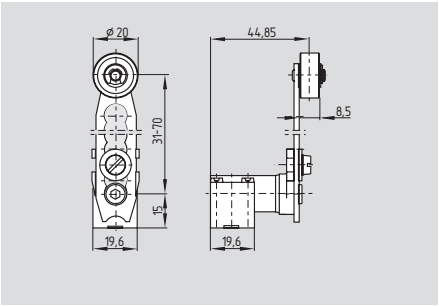
Contact variants

Contacts/ Switch travel	Snap action	Slow action
2 NC	**ZV14H 2..-02-AS**	**TV14H 2..-02-AS**





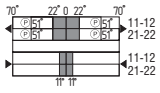
Roller lever V7H-2138

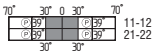


- Lever angle adjustable in 10° steps
- Actuating torque: Min. 15 Ncm
- Positive break torque: 18.5 Ncm
- Actuating speed with actuating angle 30° to switch axis max. 1 m/s
- Actuator head gasket, ordering suffix -Z

Contact variants

Contacts/ Switch travel	Snap action	Slow action
2 NC	**ZV7H 2..-02-AS-2138**	**TV7H 2..-02-AS-2138**





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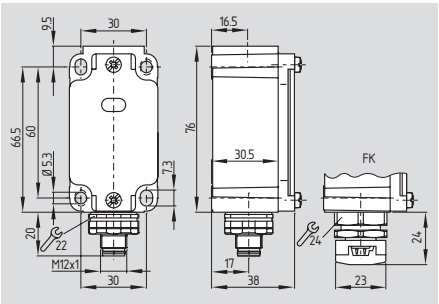
For detailed information, check out
www.schmersal.com

T 335 AS



Position switches with safety functions
- Mounting details to DIN EN 50041
- Metal enclosure
- Integrated AS-Interface interface
- AS-Interface LED and status display
- AS-Interface M12 connector (turnable) or flat cable connection (turnable)
- Suitable for AS-i Power24
- Wide range of alternative actuators
- Actuator heads can be repositioned by 4 x 90°
- Angle of roller lever adjustable in 10° steps
- Good resistance to oil and petroleum spirit
- Protection class IP67

Approvals

* under preparation

Technical data

Standards:	EN 50295, EN 60947-5-1, EN ISO 13849-1, IEC 61508
Design:	fixings to DIN EN 50041
Material of the housings:	zinc die-cast, enamel finish
Switching system:	slow action, NC contacts with positive break ⊖
Max. Actuating speed:	1 m/s
Response time:	< 100 ms

Mechanical data

Design of electrical connection:	Connector M12, 5-pole, or flat cable connection
Switching frequency:	max. 5000/h
Mechanical life:	> 1.000.000 operations

Ambient conditions

Ambient temperature:	−25 °C … +60 °C
Storage and transport temperature:	−25 °C … +85 °C
Relative humidity:	30 %… 95 %
- non-condensing	
- non-icing	
Protection class:	IP67 to IEC/EN 60529
Protection rating:	II
Resistance to vibration:	10 … 150 Hz, amplitude 0,35 mm / 5g
Resistance to shock:	30 g / 11 ms

Electrical data - AS interface

AS-i Supply voltage:	18,0 … 31,6 VDC, protection against polarity reversal
AS-i operating current:	≤ 50 mA
AS-i Device insulation::	internally short-circuit proof
AS-i Specification	
- Version:	V 3.0
- Profile:	S-0.B.F.F
AS-i Inputs	
- Channel 1:	Data bits DI 0/DI 1= dynamic code transmission
- Channel 2:	Data bits DI 2/DI 3= dynamic code transmission
AS-i Outputs	
- DO 0 … DO 3:	not used
AS-i Parameter bits	
- P0:	Channel 2 switched
- P1 … P3:	not used

Technical data

AS-i input module address:	0
- Default on address 0, programmable via the AS-Interface Master or Hand-held programming device	

AS-i LED switching conditions display

(1) yellow LED:	Channel 1 / AS-i SaW bit 0,1
(2) green/red LED (AS-i duo LED):	Supply voltage / Communication error / Slave address = 0
(3) yellow LED:	Channel 2 / AS-i SaW bit 2,3

Classification

If a fault exclusion for hazardous damage of the 1-channel mechanics is authorized and an adequate protection against tampering is ensured, suitable for use up to:

Standards:	EN ISO 13849-1, IEC 61508
PL:	up to d
Category:	up to 3
PFH value:	1,01 x 10^{-7}/h
- Notice:	up to max. 100.000 switching cycles/year
SIL:	up to 2
Mission time:	20 years

Basically suitable up to

Standards:	EN ISO 13849-1, IEC 61508
PL:	up to c
Category:	up to 1
PFH value:	1,14 x 10^{-6}/h
- Notice:	up to max. 100.000 switching cycles/year
SIL:	up to 1
Mission time:	20 years

Ordering details

T① 335 ②-AS

No.	Option	Description
	T = Slow action ⊖	
①	For the appropriate actuator: see as of page **5-66**	
②	ST	Connector M12, metal
	FK	Flat cable connection

Note

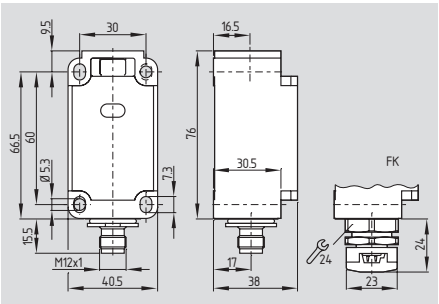
Pin configuration
M12 connector
5-pole

PIN 1: AS-i +
PIN 2: spare
PIN 3: AS-i −
PIN 4: spare
PIN 5: FE (Functional earth connection)

Note

Addressing through the M12 connector or the flat cable connection

T 336 AS



Position switches with safety functions
- Mounting details to DIN EN 50041
- Thermoplastic enclosure
- Integrated AS-Interface interface
- AS-Interface LED and status display
- AS-Interface M12 connector, or flat cable connection (turnable)
- AS-i Power24 geeignet
- Wide range of alternative actuators
- Actuator heads can be repositioned by 4 x 90°
- Angle of roller lever adjustable in 10° steps
- Good resistance to oil and petroleum spirit
- Protection class IP67

Approvals

TÜV * cULus * ASi * under preparation

CE

Technical data

Standards:	EN 50295, EN 60947-5-1, EN ISO 13849-1, IEC 61508
Design:	fixings to DIN EN 50041
Material of the housings:	plastic, glass-fibre reinforced thermoplastic, self-extinguishing
Switching system:	slow action, NC contacts with positive break ⊖
Max. Actuating speed:	1 m/s
Response time:	< 100 ms

Mechanical data

Design of electrical connection:	Connector M12, 4-pole, or flat cable connection
Switching frequency:	max. 5000/h
Mechanical life:	> 1.000.000 operations

Ambient conditions

Ambient temperature:	−25 °C … +60 °C
Storage and transport temperature:	−25 °C … +85 °C
Relative humidity:	30 %… 95 %
- non-condensing	
- non-icing	
Protection class:	IP67 to IEC/EN 60529
Protection rating:	II, ⧈
Resistance to vibration:	10 … 150 Hz, amplitude 0,35 mm / 5g
Resistance to shock:	30 g / 11 ms

Electrical data - AS interface

AS-i Supply voltage:	18,0 … 31,6 VDC, protection against polarity reversal
AS-i operating current:	≤ 50 mA
AS-i Device insulation::	internally short-circuit proof
AS-i Specification	
- Version:	V 3.0
- Profile:	S-0.B.F.F
AS-i Inputs	
- Channel 1:	Data bits DI 0/DI 1= dynamic code transmission
- Channel 2:	Data bits DI 2/DI 3= dynamic code transmission
AS-i Outputs	
- DO 0 … DO 3:	not used
AS-i Parameter bits	
- P0:	Channel 2 switched
- P1 … P3:	not used

Technical data

AS-i input module address:	0
- Default on address 0, programmable via the AS-Interface Master or Hand-held programming device	

AS-i LED switching conditions display

(1) yellow LED:	Channel 1 / AS-i SaW bit 0,1
(2) green/red LED (AS-i duo LED):	Supply voltage / Communication error / Slave address = 0 / periphery error
(3) yellow LED:	Channel 2 / AS-i SaW bit 2,3

Classification

If a fault exclusion for hazardous damage of the 1-channel mechanics is authorized and an adequate protection against tampering is ensured, suitable for use up to:

Standards:	EN ISO 13849-1, IEC 61508
PL:	up to d
Category:	up to 3
PFH value:	1,01 x 10^{-7}/h
- Notice:	up to max. 100.000 switching cycles/year
SIL:	up to 2
Mission time:	20 years

Basically suitable up to

Standards:	EN ISO 13849-1, IEC 61508
PL:	up to c
Category:	up to 1
PFH value:	1,14 x 10^{-6}/h
- Notice:	up to max. 100.000 switching cycles/year
SIL:	up to 1
Mission time:	20 years

Ordering details

T① 336 ②-AS

No.	Option	Description
	T = Slow action ⊖	
①	For the appropriate actuator: see as of page **5-66**	
②	ST	Connector M12, metal
	FK	Flat cable connection

Note

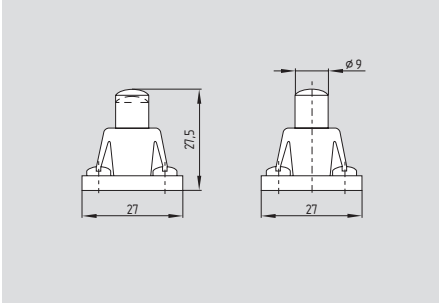
Pin configuration
M12 connector

4-pole	PIN 1: AS-i +
	PIN 2: spare
	PIN 3: AS-i −
	PIN 4: spare

Note

Addressing through the M12 connector or the flat cable connection

Plunger S

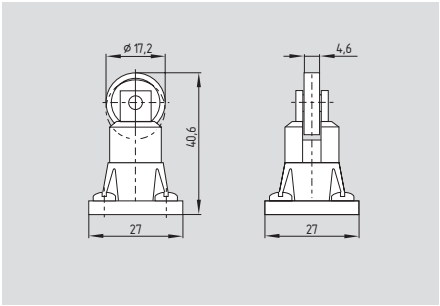


- Actuator type B to EN 50041
- Actuating force: Min. 17 N
- Actuating speed with actuating angle 0° to switch axis max. 0.5 m/s

Contact variants

Contacts/ Switch travel	Slow action
2 NC	**TS 3..-02-AS**

Roller plunger R

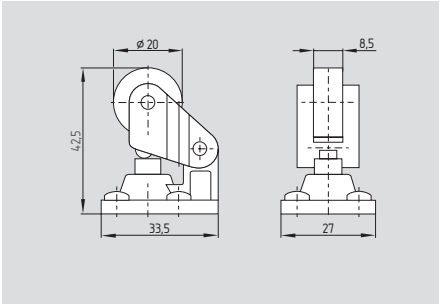


- Actuator type C to EN 50041
- Actuating force: Min. 17 N
- Actuating speed with actuating angle 30° to switch axis max. 0.5 m/s

Contact variants

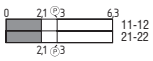
Contacts/ Switch travel	Slow action
2 NC	**TR 3..-02-AS**

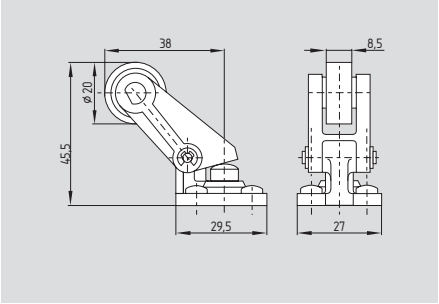
Angle roller lever 1K



- Actuating force: Min. 17 N
- Actuating speed with actuating angle 30° to switch axis max. 0.5 m/s

Contact variants

Contacts/ Switch travel	Slow action
2 NC	**T1K 3..-02-AS**

Angle roller lever 3K

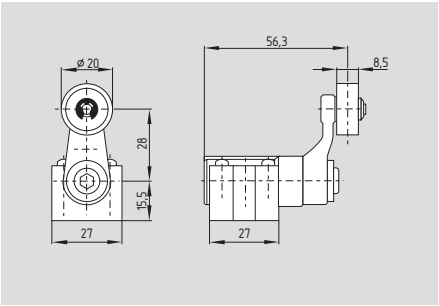


- Actuating force: Min. 17 N
- Actuating speed with actuating angle 30° to switch axis max. 0.5 m/s
- Actuation parallel to axis of switch from below

Contact variants

Contacts/ Switch travel	Slow action
2 NC	**T3K 3..-02-AS**

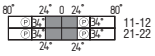
Roller lever VH/V1H



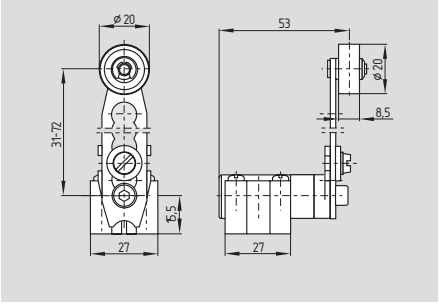
- Actuator type A to EN 50041
- Actuating torque: Min. 31 Ncm
- Actuating speed with actuating angle 30° to switch axis max. 1 m/s
- Also with plastic roller 25 mm available, ordering suffix 1H
- With metal roller, ordering suffix –RMS

Contact variants

Contacts/ Switch travel	Slow action
2 NC	**T4VH 3..-02-AS** **T4V1H 3..-02-AS**



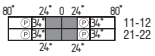
Roller lever V7H-2138



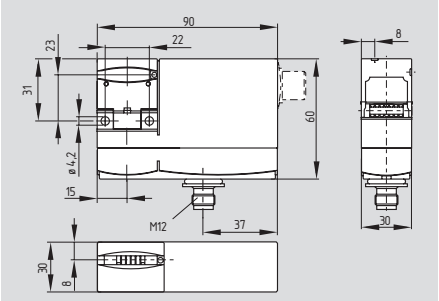
- Actuating torque: Min. 31 Ncm
- Actuating speed with actuating angle 30° to switch axis max. 1 m/s

Contact variants

Contacts/ Switch travel	Slow action
2 NC	**T4V7H 3..-02-AS-2138**



AZM 170 AS



- Solenoid interlock with 2 variants
  AZM 170 B ST-AS: Enabling signal, only when safety guard closed
  AZM 170 BZ ST-AS:
  AS-i semi-code 2, when safety guard closed
  AS-i semi-code 1, when safety guard locked
- High holding force 1000 N
- Integrated AS-Interface interface
- AS-Interface LED status display
- AS-Interface M12 connector
- AS-Interface magnet control
- Magnet voltage supply through 24 VDC auxiliary voltage
- Manual release for power to unlock
- Protection class IP67

Approvals

Technical data

Standards:	EN 50295, EN 60947-5-1, IEC 61508, EN ISO 13849-1
Duty cycle:	Magnet 100 %
Material of the housings:	glass-fibre reinforced thermoplastic, self-extinguishing

Mechanical data

Design of electrical connection:	Connector M12, 4-pole
Mechanical life:	> 1.000.000 operations
Manual release (Y/N):	No
Response time:	< 100 ms
Latching force:	30 N
Clamping force F_{max}:	1000 N
Max. Actuating speed:	≤ 2 m/s

Ambient conditions

Ambient temperature:	−25 °C … +55 °C
Storage and transport temperature:	−25 °C … +85 °C
Relative humidity:	30 % ... 95 %
- non-condensing	
- non-icing	
Protection class:	IP67 to IEC/EN 60529
Protection rating:	II ⧈

Electrical data - AS interface

AS-i Supply voltage:	26.5 ... 31.6 VDC, protection against polarity reversal
AS-i operating current:	≤ 50 mA
AS-i Device insulation:	internally short-circuit proof
AS-i Specification	
- Version:	V 2.1
- Profile:	S-7.B.F.E
AS-i Inputs	
- Channel 1:	Data bits DI 0/DI 1= dynamic code transmission
- Channel 2:	Data bits DI 2/DI 3= dynamic code transmission
AS-i Outputs	
- DO 0:	Solenoid control
- DO 1 … DO 3:	not used

Technical data

AS-i Parameter bits	
- P0:	Safety guard and actuator detected
- P1:	Solenoid interlockblocked
- P2 … P3:	not used
AS-i input module address:	0
- Default on address 0, programmable via the AS-Interface Master or Hand-held programming device	

Electrical data - Auxiliary voltage (Aux)

Supply voltage U_B:	24 VDC (−15 % / +10 %) (stabilised PELV)
Operating current:	≤ 500 mA
Device insulation:	≤ 4 A (if used in accordance with UL 508)

AS-i LED switching conditions display

(1) green LED:	Supply voltage
(2) red LED:	Communication error / Slave address = 0
(3) yellow LED:	Enabling status

Dimensions

Dimensions:	90 mm x 75.5 mm

Classification

If a fault exclusion for hazardous damage of the 1-channel mechanics is authorized and an adequate protection against tampering is ensured, suitable for use up to:

Standards:	EN ISO 13849-1, IEC 61508
PL:	up to d
Category:	3
PFH value:	1.01 x 10^{-7}/h
- Notice:	up to max. 100.000 switching cycles/year
SIL:	up to 2
Mission time:	20 years

Basically suitable up to

Standards:	EN ISO 13849-1, IEC 61508
PL:	up to c
Category:	1
PFH value:	1.16 x 10^{-6}/h
- Notice:	up to max. 100.000 switching cycles/year
SIL:	up to 1
Mission time:	20 years

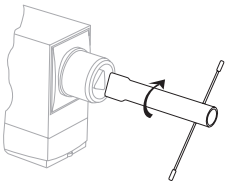
Ordering details

AZM 170 ① ST-AS ②③P④

No.	Option	Description
①	B	Actuator monitored
	BZ	Combined actuator/solenoid interlock monitoring
②		Latching force 5 N
	R	Latching force 30 N
③		Power to unlock
	A	Power to lock
④	2197	Manual release for power to unlock

Actuators must be ordered separately.

Note



Manual release from side

- For manual release using M5 triangular key, available as accessory
- Manual release available for power to unlock principle
- Ordering suffix -2197

Note

Pin configuration
M12 connector

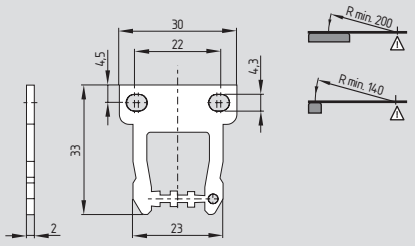
4-pole

PIN 1: AS-i +
PIN 2: Aux − (P)
PIN 3: AS-i −
PIN 4: Aux + (P)

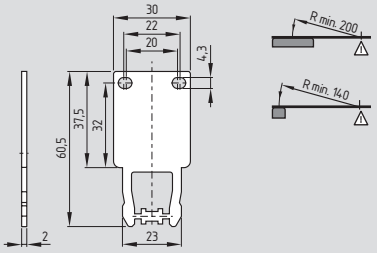
The addressing must take place via the M12 connector.

Interlocks with power to lock principle may only be used in special cases after a thorough evaluation of the accident risk, since the guarding device can immediately be opened on failure of the electrical power supply or when the main switch is opened.

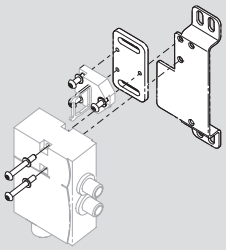
System components



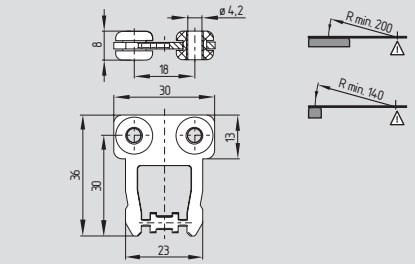
Straight actuator AZ 17/170-B1



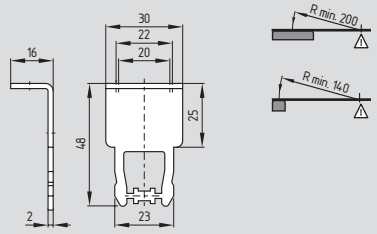
Long straight actuator AZ 17/170-B11



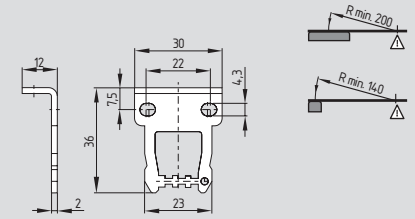
Mounting set MS AZM 170



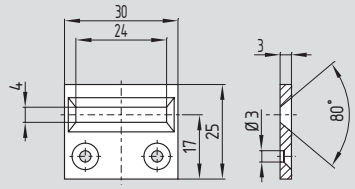
AZ 17/170-B1-2245 with rubber mounting



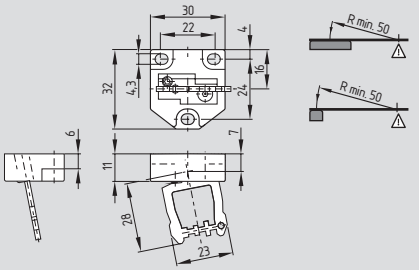
Long angled actuator AZ 17/170-B15



Angled actuator AZ 17/170-B5



Centering guide AZM 170-B



Flexible actuator AZM 170-B6

Ordering details

Straight actuator	**AZ 17/170-B1**
with rubber mounting	**AZ 17/170-B1-2245**
Angled actuator	**AZ 17/170-B5**
Flexible actuator	**AZM 170-B6**

Ordering details

Long straight actuator	**AZ 17/170-B11**
Long angled actuator	**AZ 17/170-B15**
Centering guide	**AZM 170-B**

Ordering details

Mounting sets	**MS AZM 170 P**
	MS AZM 170 R/P
Tamperproof screws with unidirectional slots (without drawing)	
M4 x 8	**1147463**
(Quantity 2 pcs)	

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The online product catalogue

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www.schmersal.net

Explosion Protection

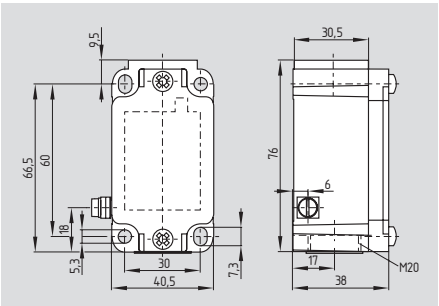
- EX-T 335 _____ Page 72
- EX-ZQ 900-3D _____ Page 74

The range of switching components for explosive atmospheres for use in the Zones 1 and 21 and Zone 22 features a lot of innovations as well. Here, the portfolio is completed by, amongst others, the EX-ZQ 900-3D pull-wire emergency stop switch and the EX-T 335 position switch.

The field of application for the new pull-wire emergency-stop switches in the dust-explosive atmospheres of Zone 22 ranges from safety-related applications on conveyors, where these switches protect conveyor belts of up to 50 meters long, to large machinery and plants e.g. in pulp and paper industry. The series can be equipped with a maximum of four switching contacts and has a wire-breakage monitoring function. The zinc die-cast enclosure is very robust and with its protection class IP67, the switch can also be used under rough conditions.

The Z/T 335 series, which was used as basis for the development of the new EX-T 335, is intensively used in many fields of machinery and plant construction for many years already. The series has been adjusted to the requirements of explosion protection and certified for use in the gas-Ex Zones 1 and 2 as well as the dust-Ex Zones 21 and 22 (equipment category 2GD) according to the ATEX Directive. As the contact variants are regarded, the user can choose the conventional variants such as 1 NO / 1 NC and 2 NC contacts as well as contacts with overlapping and staggered contacts.

EX-T 335-...



- Ex certified
- Mounting details to EN 50041
- Metal enclosure
- Slow action available with 2 positive break NC contacts to EN 60947-5-1
- Slow action available with overlapping contacts
- Wide range of alternative actuators
- Actuator heads can be repositioned by 4 x 90°
- Angle of roller lever adjustable in 10° steps
- Good resistance to oil and petroleum spirit
- 1 cable entry M20
- Including EX-certified screwed cable gland

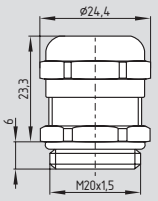
Approvals

IECEx Ex CE

Technical data

Equipment category:	Ex II 2GD
Ex protection:	Ex de IIC T6 Ex tD A21 IP65 T80°C
Standards:	EN 60947-5-1 EN 61241-0 EN 61241-1 EN 60079-0 EN 60079-1 BG-GS-ET-15
Design:	DIN EN 50041
Enclosure:	light-alloy diecast, paint finish
Max. impact energy:	7 J
Actuating speed:	max. 1 m/s
Protection class:	IP65 to EN 60529
Contact material:	silver
Contact type:	change-over contact with double break, type Zb or 2 NC contacts, with galvanically separated contact bridges
Switching system:	IEC 60947-5-1 slow action, NC contacts with positive break
Connection:	screw terminals
Cable section:	1 mm² ... 2,5 mm² (incl. conductor ferrules)
Cable entry:	1 x M20
U_{imp}:	4 kV
U_i:	250 V
I_{the}:	5 A
Utilisation category:	AC-15
Max. fuse rating:	6 A gG D-fuse
Ambient temperature:	−20 °C ... + 55 °C for cable section 2.5 mm² −20 °C ... + 50 °C for cable section 1 mm²
Mechanical life:	1 million operations
Switching frequency:	max. 1800/h
Bounce duration:	< 3 ms
Switchover time:	in accordance with actuating speed
Cable cross-section of the cable glands:	min. Ø 7 mm max. Ø 12 mm
	Ex II 2GD

System components



EX-certified screwed cable gland

Ordering details

EX-T① 335-②Y③-④

No.	Option	Description
①		A selection of suitable actuators can be found on the next page
②	11	1 NO / 1 NC
	02	2 NC
	20	2 NO *
③	UE	with overlapping contacts with staggered contacts
④	2138	Roller lever 7H for safety duties

* Switches with 2 NO contacts (20) are only suitable for positioning tasks!

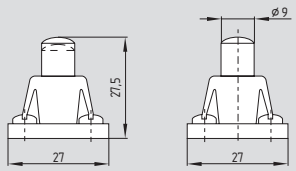
Note

The detailed technical description of the different actuators can be found in the “ATEX explosion protection” catalogue.

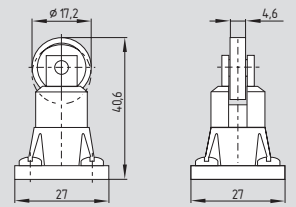
Ordering details

EX-certified screwed cable gland	**EX-KLE-M20x1,5**

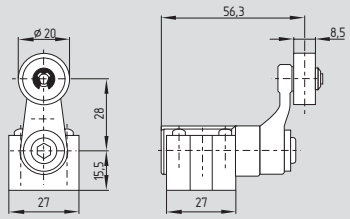
System components



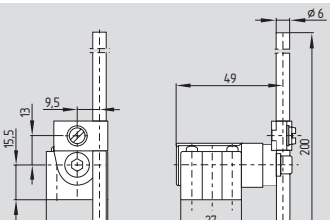
Plunger S



Roller plunger R

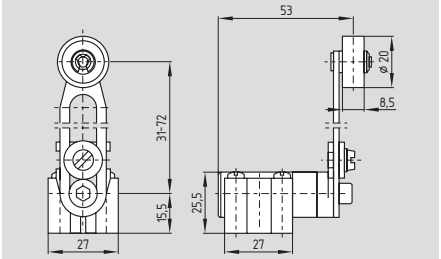


Roller lever H

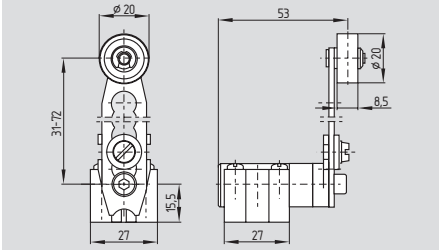


Rod lever 10H

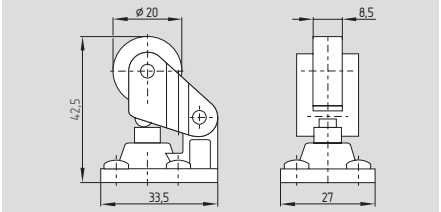
System components



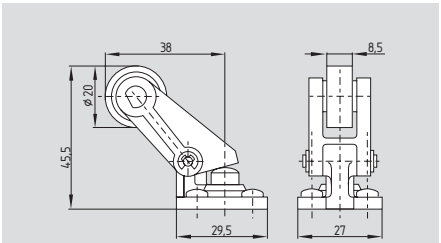
Roller lever 7H



Roller lever 7H-2138



Offset roller lever 1K



Angle roller lever 3K

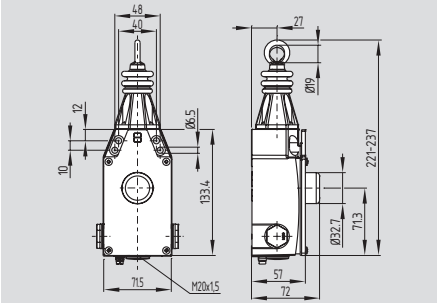
Ordering details

Plunger	**S**
Roller plunger	**R**
Roller lever	**H**
Rod lever	**10H**

Ordering details

Roller lever	**7H**
Roller lever	**7H-2138**
Offset roller lever	**1K**
Angle roller lever	**3K**

EX-ZQ 900-3D



- To EN ISO 13850 / IEC 60947-5-5
- Metal enclosure
- 4 contacts
- Position indicator
- Robust design
- Large wiring compartment
- 3 cable entries M20
- One tension force for wire lengths from 5 to 50 m
- Wire up to 50 m long
- Reset pushbutton
- Twisting of connection ring not possible
- External watertight collar
- Wire pull and breakage function
- Stainless
- Including EX-certified screwed cable gland
- Including EX-certified screw plug

Approvals

Technical data

Equipment category:	Ⓔx II 3D
Ex protection:	Ex tD A22 IP67 T100°C
Standards:	IEC/EN 60947-5-1
	IEC/EN 60947-5-5
	EN 61241-0
	EN 61241-1
	EN ISO 13850
Enclosure:	zinc die-cast, enamelled
Cover:	stainless steel
Protection class:	IP67 to EN 60529
Contact material:	silver
Max. impact energy:	7 J
Contact type:	1 NC/1 NO
	or 2 NC/2 NO
	or 3 NC/1 NO
	or 2 NC
	or 4 NC
Switching system:	⊖ IEC 60947-5-1
	snap action with positive
	break NC contacts
Connection:	screw terminals
Cable section:	max. 2.5 mm²
	(incl. conductor ferrules)
Cable entry:	3 x M20
U_{imp}:	6 kV
U_i:	500 V
I_{the}:	6 A
Utilisation category:	AC-15, DC-13
I_e/U_e:	4 A / 230 VAC
	1 A / 24 VDC
Max. fuse rating:	6 A gG D-fuse
	to DIN EN 60269-1
Ambient temperature:	−20 °C ... +60 °C
Mechanical life:	1 million operations
Maximum cable length:	50 m
	(please observe ambient temperature range and wire supports)
Features:	wire pull and breakage detection
Cable cross-section of the cable glands:	min. Ø 7 mm
	max. Ø 12 mm
	Ⓔx II 2GD

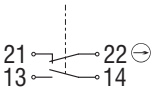
Classification:

Standards:	EN ISO 13849-1
B_{10d} (NC):	100,000
Mission time:	20 years

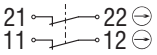
$$MTTF_d = \frac{B_{10d}}{0{,}1 \times n_{op}} \qquad n_{op} = \frac{d_{op} \times h_{op} \times 3600\ s/h}{t_{cycle}}$$

Contact variants

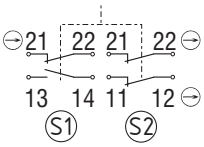
1 NO/1 NC



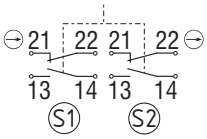
2 NC



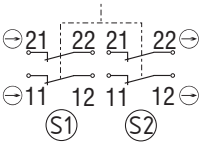
1 NO/3 NC



2 NO/2 NC



4 NC



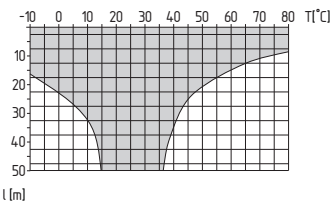
Ordering details

EX-ZQ 900-①-3D

No.	Option	Description
①	11	1 NO/1 NC
	13	1 NO/3 NC
	22	2 NO/2 NC
	02	2 NC
	04	4 NC

Note

Recommended cable lengths for pull-wire Emergency-Stop switches in relation to the range of ambient temperature.
At 5 m distance intermediate wire supports are required, see accessories.



Ordering details

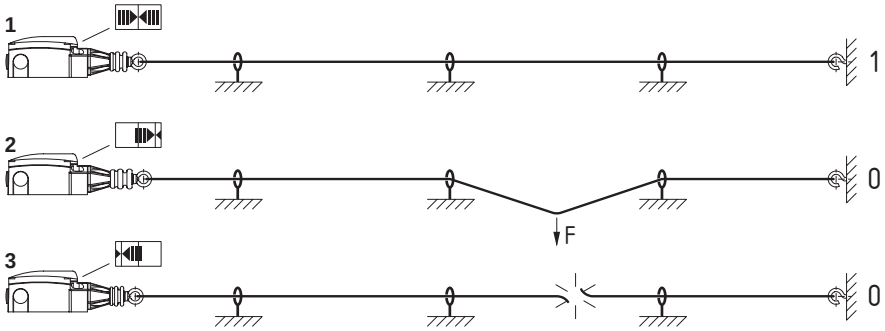
EX-certified screwed cable gland	**EX-KLE-M20x1,5**
EX-certified screw plug (without drawing)	**EX-VS-M20x1,5**

Dust zone 22

Mode of operation

Legend
1 Not actuated
2 Wire pull detection
3 Wire breakage detection

Wire pull and breakage detection

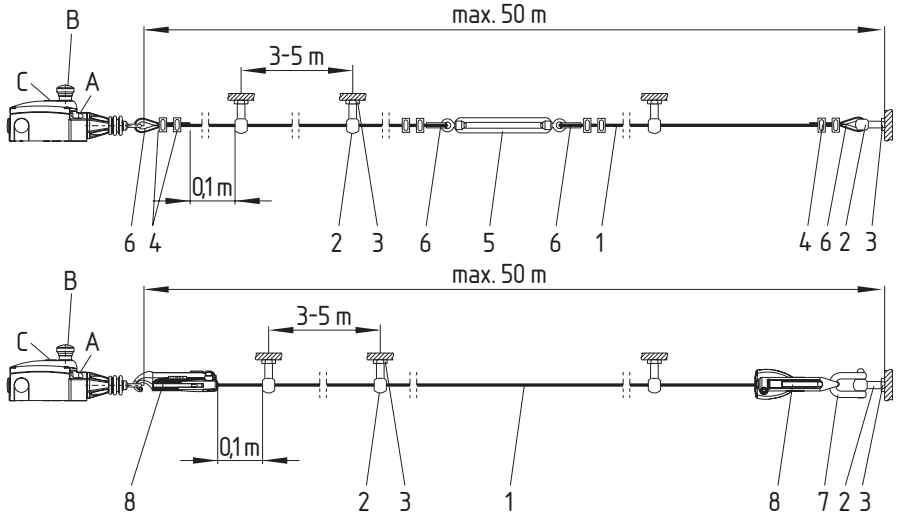


Mounting instructions

Legend
1 Wire rope
2 Eyebolt
3 Nut
4 Wire clamp
5 Tensioner
6 Wire thimble
7 Shackle
8 Rope tensioner

A Position indicator
B Emergency stop button

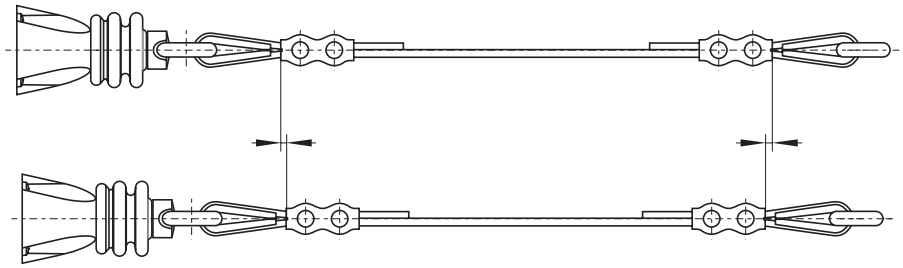
One-side operation



Mounting instructions

As the thimbles are subject to deformation in case of wire pull, the wire should be pulled several times after fitting.
After that, the wire must be re-tensioned using the eyebolt or the tensioner.

Thimble deformation



Dust zone 22

A basket full of solutions
Food

For detailed information, check out
www.schmersal.com

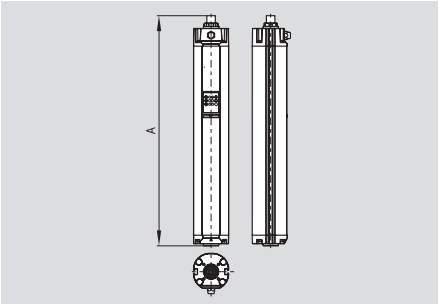
■ SLC 421 _____ Page 78

The new safety light curtains of the SLC 421 series are characterized by their especially user-friendly parameter setting functionality. For the parameter setting, PC softwa re neither a programming device is required. To set the different operating modes, the pre-wired BDB 01 or BDT 01 operating units with the ready-mounted necessary command devices (key-operated and selector switch) are available.

Fixed and dynamic beam blanking
If material is conveyed through the protection field of a safety light curtain, individual light beams need to be blanked. On machinery with work piece supports, the fixed and dynamic beam blanking feature is used to ensure a trouble-free work process.
The user-friendly parameter setting enables frequent adjustments to variable work processes. The desired teach-in mode is simply activated by means of a key selector switch.

Cyclic function
In this operating mode, the machine automatically starts a work cycle as soon as the operator releases the protection field. The process is terminated by means of a machine signal (hazardous movement “OFF”) and the next cycle is automatically activated by the material change.

SLC 421



- **Safety light curtain**
- Category Type 4 to IEC/EN 61496-1, -2
- Resolution 14 and 30 mm
- Protection field heights from 170 ... 1770 mm
- Smooth parameter assignment using external command devices, no PC software required
- Integrated start/restart interlock
- Integrated contactor control
- Integrated blanking function (fixed and floating blanking)
- Integrated cyclic function 1 or 2-cycle operation
- Diagnostic and parametrization interface
- Range 0.3 ... 10 m
- Fail-safe transistor outputs
- Optical synchronisation
- Status display
- Protection class IP67

Legend:
A: Total length
Transmitter A = 84.5 mm + protected field height
Receiver A = 148.5 mm + protection field height

Approvals

Technical data

Standards:	IEC/EN 61496-1/-2
Control Category:	Type 4
Enclosure:	Aluminium
Enclosure dimensions:	Ø 49 mm
Connection:	Connector
- Transmitter:	M12, 4-pole,
- Receiver:	M12, 12-pole and M8, 6-pole
Max. cable length:	100 m / 1 Ω
Protection class:	IP67 to EN 60529
Response time:	15 … 32 ms (depends on length and resolution)
Detection sensitivity (resolution):	14 and 30 mm
Protected height:	
- Resolution 14 mm	170 ... 1450 mm
- Resolution 30 mm	170 ... 1770 mm
Protection field width, range:	
- Resolution 14 mm	0,3 m ... 7 m
- Resolution 30 mm	0.3 m … 10 m
Start/restart interlock:	Integrated
Contactor control:	Integrated
Blanking function:	Integrated
Cyclic operation:	1 cycle or 2 cycles
Light emission wavelength:	880 nm (infrared)
U_e:	24 VDC ± 10%
Safety outputs:	2 x PNP, 500 mA
Power consumption:	Emitter 4 W, Receiver 8 W
Data interface:	RS 485
Status and diagnostics:	LED display
Ambient temperature:	−10 °C … +50 °C
Storage and transport temperature:	−20 °C … +70 °C
Classification:	
Standards:	EN ISO 13849-1; IEC 61508
PL:	up to e
Control category:	up to 4
PFH-value:	7.42 x 10^{-9}/h
SIL:	up to 3
Service life:	20 years

Ordering details

SLC 421-E/R①-②-RFBC-③

No.	Option	Description
①	xxxx	Protected heights (mm) Available lengths: 0170, 0250, 0330, 0410, 0490, 0570, 0650, 0730, 0810, 0890, 0970, 1050, 1130, 1210, 1290, 1370, 1450, 1530*, 1610*, 1690*, 1770*
②	14, 30	Resolution 14 mm, 30 mm
③	01	Integrated status indication (rt/gn) (optional)

* only 30 mm

Note

Control unit

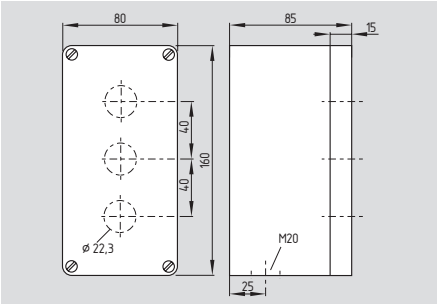
Blanking control unit BDB 01	refer to page 79
Control unit cyclic operation BDT 01	refer to page 79

Ordering details

Connector:

Female connector **for emitter**	
M12, 4-pole, straight	
Cable length 5 m	**1207741**
Cable length 10 m	**1207742**
Cable length 20 m	**1207743**
Female connector **for receiver**	
M12, 12-pole, straight	
Cable length 5 m	**1213353**
Cable length 10 m	**1213352**
Female connector **for receiver/control unit**	
M8, 6-pole, angled	
Cable length 2 m	**1213355**
Cable length 5 m	**1213354**

BDB 01



- **Blanking control unit**
- Smooth parameter assignment using external command devices, no PC software required
- Modular enclosure in ABS version
- 3 Command devices:
  1 key-operated switch (Pos. 0, 1)
  1 selector switch, latching
  1 restart button

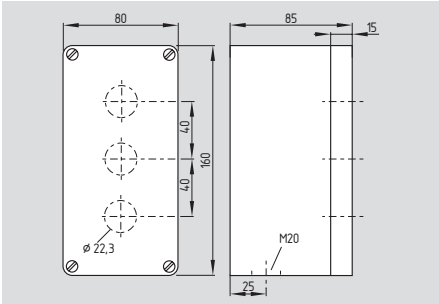
Approvals

CE

Ordering details

BDB 01 **1213356**

BDT 01



- **Control unit cyclic operation**
- Smooth parameter assignment using external command devices, no PC software required
- Modular enclosure in ABS version
- 3 Command devices:
  1 key-operated switch (Pos. 0, 1, 2)
  1 teach-in button
  1 restart button

Approvals

CE

Ordering details

BDT 01 **1213358**

Technical data

Standards:	IEC/EN 60947-5-1
Enclosure:	ABS
Protection class:	IP40
Contact type BDB 01	
- Key-operated switch:	2 NC / 2 NO
- Selector switch:	2 NC / 4 NO
- Restart button:	1 NO
Contact type BDT 01:	
- Key-operated switch:	2 NC / 4 NO
- Teach-in button:	1 NO
- Restart button:	1 NO
Switching system:	IEC 60947-5-1
Connection:	PVC cable, 5 m long
Cable section:	8 x 0.25 mm²
Cable entry:	M20
U_{imp}:	4 kV
I_{the}:	3 A
Utilisation category:	DC-13
I_e/U_e:	1 A / 24 VDC
Max. fuse rating:	6 A gL D-fuse
Ambient temperature:	−10 °C … +50 °C
Mechanical life:	
- Key-operated switch:	1 million operations
- Selector switch:	1 million operations
- Button:	1 million operations
Switching frequency:	max. 50/h
Dimensions (L x W x H):	160 x 80 x 85mm

Miscellaneous innovations / program extensions

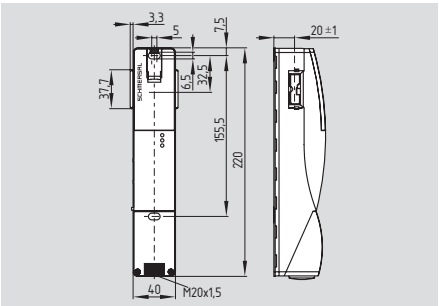
- AZ/AZM 200-B30-...-SZ _____Page 81
- SZ 200-1_____Page 81

Schmersal continuously completes and extends its product portfolio by useful accessories as well.

For the AZ/AZM 200 series, two new lockout tags were developed, which can be used in accordance with the desired application.

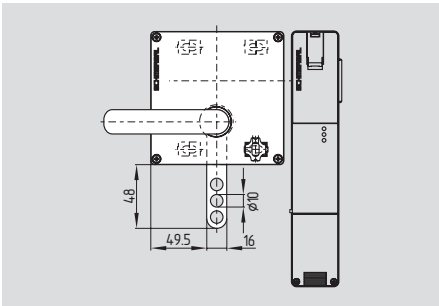
Lockout tags prevent people from being inadvertently locked up inside accessible hazardous areas. When entering the hazardous area, the operating or servicing staff attaches a lock to the lockout tag. The lockout tag blocks the insertion hole of the actuator in unlocked condition so that the safety guard cannot be locked, thus preventing any inadvertent machine start.

AZ/AZM 200



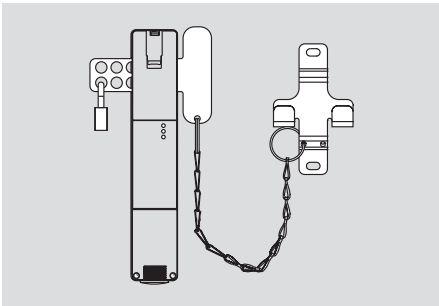
• Solenoid interlock or safety switch with interlocking function, slim design (40 mm)

B30 with lockout tag



• AZ/AZM 200-B30 actuator with SZ lockout tag

Lockout tag SZ 200-1



• Separate lockout tag SZ 200-1 for doorpost mounting

Approvals

CE

Approvals

CE

Ordering details

AZ/AZM 200-B30-①TA②③-④

No.	Option	Description
①	L	Door hinge on left-hand side
	R	on right-hand side
②	G1	With door handle
	G2 *	With rotary button
③	P1	With emergency exit
	P20	With emergency exit metal
	P25	With emergency exit with inset handle
④	SZ	With lockout tag

* Version with rotary button G2 cannot be combined with SZ lockout tag

Ordering details

Lockout tag	**SZ 200-1**

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For many years the privately owned Schmersal Group has been developing and manufacturing products to enhance occupational safety. What started out with the development and manufacture of a very wide variety of mechanical and non-contact switchgear has now become the world's largest range of safety systems and solutions for the protection of man and machine. Over 1,200 employees in more than 20 countries around the world are developing safety technology solutions in close cooperation with our customers, thus contributing to a safer world.

Motivated by the vision of a safe working environment, the Schmersal Group's engineers are constantly working on the development of new devices and systems for every imaginable application and requirement of the different industries. New safety concepts require new solutions and it is necessary to integrate new detection principles and to discover new paths for the transmission and evaluation of the information provided by these principles. Furthermore, the set of ever more complex standards, regulations and directives relating to machinery safety also requires a change in thinking from the manufacturers and users of machines.

These are the challenges which the Schmersal Group, in partnership with machinery manufacturers, is tackling and will continue to tackle in the future.

Product ranges

Safe switching and monitoring
- Guard door monitoring safety switches
- Command devices with safety function
- Tactile safety devices
- Optoelectronic safety devices

Safe signal processing
- Safety monitoring modules
- Safety controllers
- Safety bus systems

Automation
- Position detection
- Command and signalling devices

Industries

- Elevators and escalators
- Packaging
- Food
- Medicine/ pharmaceuticals
- Machine tools
- Wood working
- Construction machines and cranes
- Renewable energy sources
- Automotive
- Chemical industry

Services

- Application advice
- CE conformity assessment
- Risk assessment in accordance with the Machinery Directive
- Stop time measurements
- Training courses

Competences

- Automation
- Explosion protection
- Hygienic design
- Machine safety

All data mentioned in this flyer have been carefully checked. Technical modifications and errors excepted.

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5.000 / L.D. / 11.2010 / Teile-Nr. 1211017 / Ausgabe 03